Early on the morning of admittance to the hospital, December 17, 1956, the patient awakened acutely dyspneic and was aware of a decided change in the clicking sound of the valve. She was therefore put in hospital for further observation and treatment. The systolic blood pressure was then generally in the range of 180 mm. of mercury and the third phase remained at around 40 or 50 mm., with the fourth phase at zero. Digitalization was carried out, and with complete bed rest the patient seemed to respond satisfactorily. Most observers agreed that there was some change in the sound of the valve, which instead of having a clear-cut clicking sound, had a slight scraping sound before each click.

Upon vaginal examination the cervix was observed to be soft and effaced and slightly dilated. It was, therefore, decided to induce premature labor by rupturing the membranes. This was carried out, and an uneventful four-hour labor ensued, with normal delivery of a healthy child. The patient did extremely well immediately following delivery, but approximately 22 hours postpartum, she suddenly had a convulsive episode, became quite unmanageable and thrashed about on the bed, necessitating restraint. The blood pressure at the time was 300 mm. systolic. No diastolic reading was obtainable. The physician, thinking the valve might have stuck, rolled the patient on her side and pounded her back. More reserpine was given intramuscularly, and sodium amytal and magnesium sulfate also were administered to control the acute agitation. By the next day the patient was quite rational and oriented, but flaccid hemiplegia on the left was noted. No abnormalities were observed in the spinal fluid. An electroencephalogram was interpreted as showing spasm in the right temporal region. The hemiplegia cleared almost completely in the following week and the patient was discharged home.

It was the opinion of a neurosurgical consultant that cerebral-angiospasm was the most likely cause of the postpartum episode. Pre-eclamptic toxemia had been considered, but the absence of albuminuria or retinal changes was against this possibility. After conversation by phone with Dr. Hufnagle (designer of the valve) the physician attending the patient suggested the possibility of retrograde thrombosis from the valve with small cerebral embolization. No completely adequate explanation of the patient's postoperative complication has been evolved. At the time of this report, some six months after the episode after parturition, the patient was doing well. There was almost no residual hemiplegia, and the blood pressure was within the normal preoperative range at 140/0 mm. of mercury. The valve sound was normal.

SUMMARY

A woman in whom an artificial valve had been placed because of aortic insufficiency, subsequently had successful completion of pregnancy. Despite an unexplained postpartum complication the patient made satisfactory recovery.

1870 Fourth Avenue, San Diego (Canfield).

Osteochondrodystrophy (Morquio-Brailsford Type)

Occurrence in Three Siblings

ROY SMITH, *M.D.*, and
JAMES J. McCORT, *M.D.*, San Jose

In 1929 Morquio[12] reported upon a family of five siblings, four of whom had the following abnormalities: The sternum "standing out to a point," relatively long limbs, genu valga, pes planus, deformity of the vertebral column, muscle weakness and atrophy, and peculiar gait resembling the walk of a duck. Radiographically there was a disturbance of osteogenesis of the epiphyses of all the bones. The children were of normal intelligence and normal pubertal development.

Three members of a family who had similar abnormalities are reported upon herein. These patients are of special interest first because they were of Japanese ancestry, which was not so in any previously reported cases, and secondly because two of the patients are twins, of which only one previous instance is known.[8]

The prognosis is generally considered poor but in cases where follow-up observations have been reported[8,13] this gloomy outlook has lacked support. Hirsch[8] from his observations of two families suggested the existence of a florid stage followed by a healing stage. One of the patients described in the present report (Case 1) seemed to have had a remission, but the period of observation thus far is not sufficiently long to refute the belief that the disease is progressive with death to be expected at an early age (14).

REPORTS OF CASES

Case 1. Patient A, a 14-year-old boy of Japanese parentage was first observed at home in December 1954. He had fallen out of his wheelchair and complained of pain in both knees. Roentgenographic examination of the legs showed greenstick fractures of both distal femora and both legs were put in long casts for a period of several months. At the end of this time firm bony union was found to have taken place. After the casts were removed, function of the legs slowly returned. In about six months he was able to discard cane and crutches and then was able to walk with a waddling gait.

From the medical history it was learned that the child was considered to be well by his parents until the age of seven when it was noted that he was of shorter stature than children of his age. At the age of ten years the patient was treated by a physician because of complaint of pain in the hips. By the age of 12 he was confined completely to a wheelchair

From the Department of Medicine and Radiology, Santa Clara County Hospital, San Jose.

Submitted March 29, 1957.

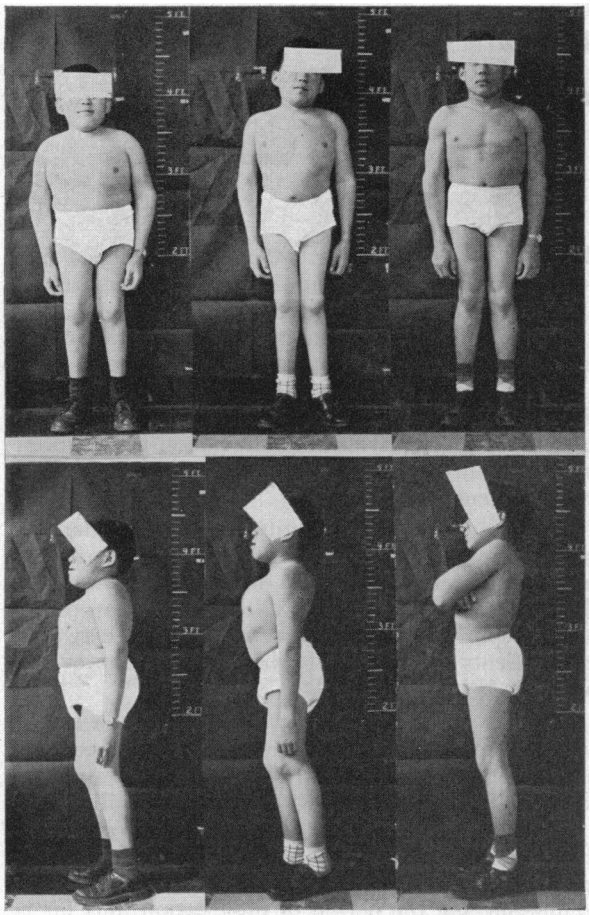

Figure 1.—Full face and profile views of three brothers, Patients A, B and C. They were shorter than Japanese boys of the same age. They all had short neck, a high, horizontal sternum and mild kyphosis. The arms reached almost to the knees. The lower extremities showed a coxa vara and genu valva deformity.

because of increasing pain in the hips and of severe weakness of both legs.

There were six siblings. Three sisters were married and childless. Two of three brothers, one of them a twin of the patient, were short in stature (Figure 1). The other brother, both the parents, and the three sisters were of normal stature. No similar skeletal abnormalities were known in either branch of the family. It was not possible to ascertain whether the twins were uniovular or binovular. They were not identical in appearance.

The patient was intelligent and cheerful. He was a high school freshman, and had a good scholastic standing. On physical examination some flattening of the bridge of the nose was noted but the skull otherwise appeared normal. The neck was extraordinarily short and the head seemed to rest upon the shoulders. The sternum stood out almost horizontally, giving the chest a barrel-shaped appearance. Kyphosis was present but not pronounced. The dorsal and lumbar spine were short and the lower ribs and the iliac crest were close together, and as there

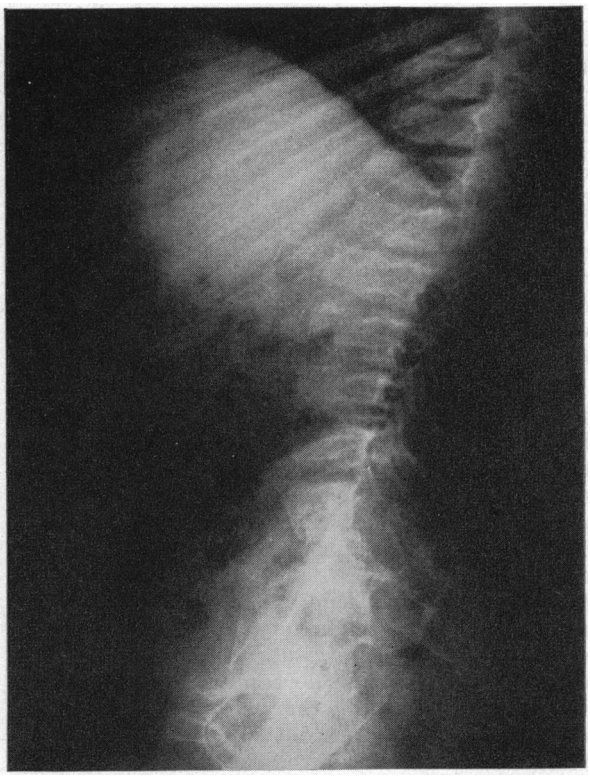

Figure 2 (Patient A).—The lateral roentgenographic view of the dorsal and lumbar spine shows a very pronounced flattening and elongation of the vertebral bodies. The superior and inferior margins of these bodies are irregular and there is a slight narrowing of the joint space. The entire spine shows a moderate degree of kyphosis.

was also a disproportion between the limbs and the trunk, the fingertips reached to the knees. The patient walked with a decided "duck-waddling" gait. Despite pain and disability he was, at the time of this report, able to walk unassisted.

X-ray examination of the dorsal and lumbar spine showed the vertebral bodies to be flattened and the anterior margins slightly irregular (Figure 2). The intervertebral spaces were also slightly narrowed. In the pelvis and hips, defective development of the epiphyses of femoral heads and the iliac crest were noted (Figure 3). These epiphyses were frayed and irregular, resulting in flattening of the femoral heads with a shortened femoral neck and bilateral coxa vara deformity. The wrists and ankles were somewhat demineralized and a coarse trabecular pattern and irregular metaphyses were noted.

CASE 2. Patient B, 14 years of age, a twin brother —apparently not identical—of the patient in Case 1 —had a short neck, horizontal sternum and kyphosis. He was knock-kneed. The changes were less pronounced than in Patient A. He was slightly taller than his twin (Figure 1) although definitely below normal stature.

Radiographically the epiphyseal disturbances were slightly less than in Patient A (Figures 4 and 5). More pronounced degenerative changes at the mar-

gins of the acetabula were present, in addition to partial subluxation of both hips.

CASE 3. Patient C, 19-year-old older brother of Patients A and B, had a short neck, very slight kyphosis of the dorsal spine, a high, prominent and almost horizontal sternum. Like his brothers he walked with a waddling gait. He was a college sophomore of excellent scholastic standing.

Radiographic examination showed elongated, frayed vertebral borders with irregular margins. There was decided irregularity of the epiphyses of both hips as well as the epiphyses of the acetabula (Figure 5). The necks of the femora were short. A coxa vara deformity and a partial subluxation of both hips were observed.

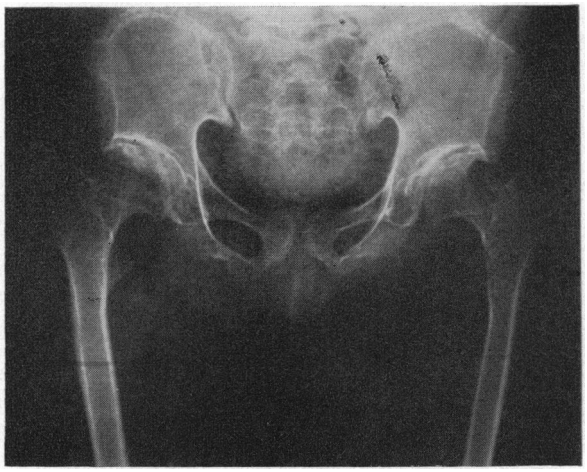

Figure 3 (Patient A).—The pelvis and hips show decided irregularity and retardation of development of the epiphyses of the head of the femora and the crest of the ilium. There is a coxa vara deformity with shortening of the femoral necks. Secondary degenerative changes are present at the margins of the acetabula.

DIFFERENTIAL DIAGNOSIS

The fundamental skeletal disturbance in these three patients was one of defective epiphyseal development. The diaphysis and metaphyses, although small, were not abnormal in appearance. Interference with epiphyseal development leading to dwarfism may be considered under three major headings: Endocrine, metabolic and developmental.

Endocrinologic disturbance of epiphyseal development during infancy and childhood is due to hypopituitarism or hypothyroidism. In hypopituitarism, the epiphyses are small, grow slowly and fuse very late in life. In hypothyroidism, the epiphyses are delayed in appearance, are small and frequently fragmented, with irregular margins. The growth and development of the epiphysis is delayed chronologically.

No endocrinologic deficiency was found in the three patients dealt with herein.

Rickets is a common example of underdevelopment of the skeleton resulting from epiphyseal disturbance of metabolic type. In childhood it may be due to a lack of sufficient vitamin D intake, an insufficient amount of calcium in the diet, a so-called resistance to vitamin D or chronic diarrheal states.

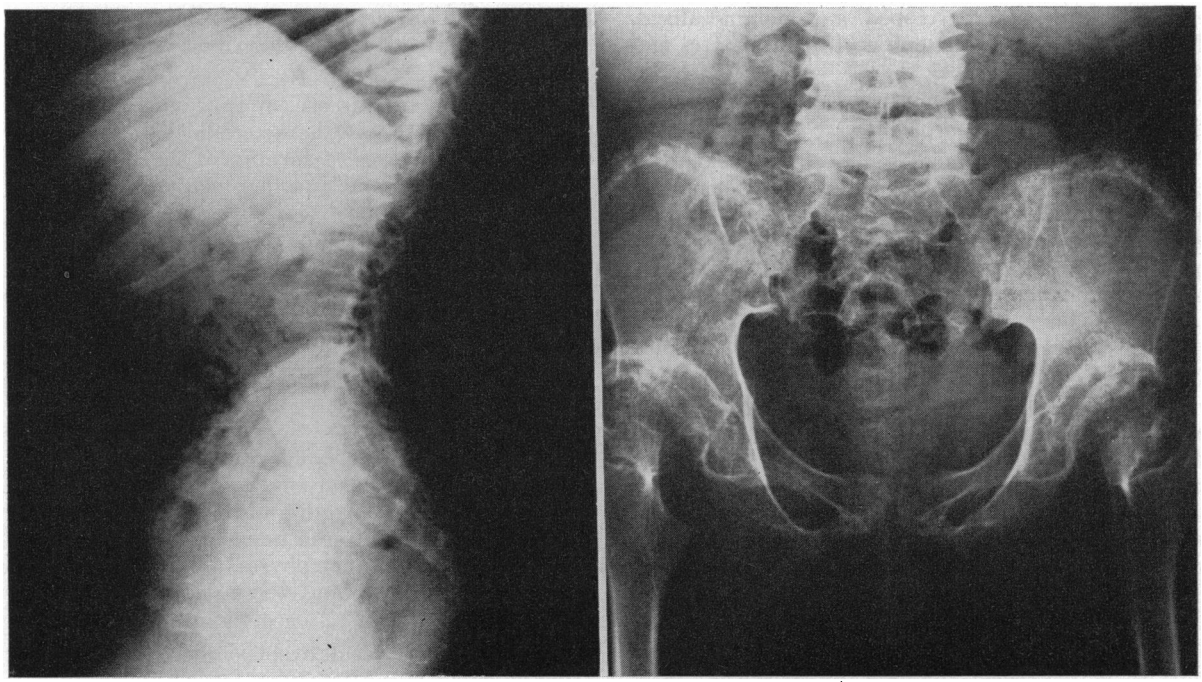

Figure 4 (Patient B).—The roentgenographic changes in the spine, pelvis and long bones are similar to those noted in Patient A, but they are slightly less pronounced. There are somewhat more degenerative changes at the margins of the acetabula. A partial subluxation in both hips is present. The tubular bones are thin and slightly demineralized (atrophy of disuse?). They are not otherwise abnormal.

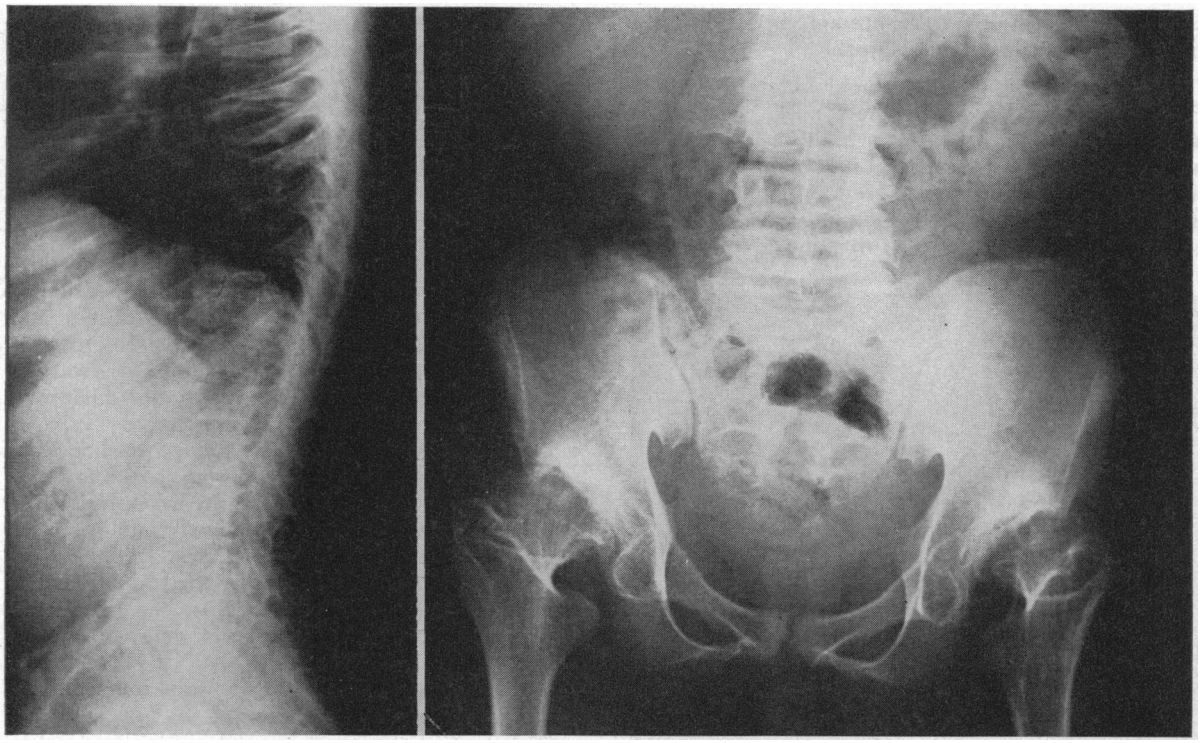

Figure 5 (Patient C).—Elongated, frayed vertebral borders with regular margins. There is marked irregularity of the epiphyses of both hips and of the epiphyses of the acetabula. The necks of the femora are short. There is a coxa vara deformity, and a partial subluxation of both hips. Secondary degenerative changes are also present.

It may also result from chronic nephritis with a loss of base, including calcium in the urine (renal rickets). In rickets the diaphysis, metaphysis and epiphysis are underdeveloped and demineralized. There is fraying and flattening of the epiphyses and the metaphyses.

No metabolic factor could be demonstrated in the three patients presented herein.

Congenital disorders of epiphyseal development can result in dwarfism of several types. Considered as developmental disorders are: Multiple epiphyseal dysplasia;[6,11] osteochondrodystrophy of the Morquio[12]-Brailsford[2] type; osteochondrodystrophy of the Hunter[9]-Hurler[10] type (gargoylism); achondroplasia, or congenital cartilaginous dysplasia;[4] and chondro-dystrophia calcificans congenita, or stippled epiphyses.[6]

Multiple epiphyseal dysplasia was described as an entity by Fairbanks[6] in 1949. Jackson, Hanelin and Albright[11] considered multiple epiphyseal dysplasia to be a disease affecting the cartilaginous epiphyses of the long bones. They reported good general development and little disability although the patients were short in stature. The spine was said to be rarely involved but in two of the six cases they reported this feature was present.

Osteochondrodystrophy of the Morquio-Brailsford type is characterized clinically by dwarfism, short neck, flat nose, horizontal sternum, kyphosis, knobby joints and genu valgum.[5] Roentgenographic features are generalized demineralization, flattening of the vertebral bodies, retarded development and fraying of the epiphyses of the long bones. The capital femoral epiphysis is flattened and there may be a coxa vara deformity of the hips.[1,7,12,14] We believe the three patients herein described fit best in this category.

Hurler-Hunter's disease, or gargoylism, has striking clinical features. Characteristically the patients have coarse features, deformity of the skull, clouding of the cornea and retarded mental development. Radiographically they also show deformity of the vertebral bodies with some elongation and irregularity at the superior and inferior margins. Further, the modeling of the distal ends of the long bones is not fully developed and these bones have a pinched-off appearance. The metacarpal bones are flat, irregular and expanded; the ribs are broad and flat; the skull is elongated with a large sella turcica and there is hepatomegaly.[3]

Achondroplasia or congenital cartilaginous dysplasia causes dwarfism of the type in which the trunk is of normal length and the extremities short. Roentgenographically the bones are broad and flat with wide flaring metaphyses. The spine is generally not involved and there is no scoliosis or kyphosis.[4]

Punctate epiphyseal dysplasia is a rare disease characterized by an irregular frayed appearance of the epiphysis as well as irregular punctate calcification in the epiphysis. The bones are short and there are usually multiple deformities.[6]

DISCUSSION

The skeletal lesions of the three patients herein reported upon were those of osteochondrodystrophy of Morquio-Brailsford type (the term proposed by Fairbank[7]). The association of thin demineralized bones with muscular weakness is difficult to explain. All motion in these patients was painful and difficult and their habits were therefore sedentary. The demineralization and weakness—a prominent feature in the present cases and in others reported in the literature—therefore may be due to a lack of stimulus to growth caused by disuse.

In studying the cases reported over the 27 years since the initial report of Morquio, one is struck by the fact that there are very few "typical" cases.[16] In any series there will be found so-called "formes frustes."[15] Thus, in the case reported by Brailsford there was no mention of a barrel chest; bilateral inguinal hernias were present, and there was a normal gait.

At present, in the clinic in which we practice, we have records of a family of 38 persons, 13 of whom are known to have multiple epiphyseal dysplasia, and the criteria which Jackson, Hanelin and Albright[11] set forth are satisfied radiographically. In making a comparison between the family with multiple epiphyseal dysplasia and the one under discussion in this paper, a number of similarities are apparent. Spinal involvement was noted in three of the 13 patients known to have metaphyseal dysplasia. All the patients were short-statured and as they grew older serious and crippling deformities developed. Radiographically the skeletal changes in the two diseases appear to differ in degree of severity and extent. A common denominator is a defective epiphyseal development which is inherited and is familial, as indicated by the higher incidence in siblings. In multiple epiphyseal dysplasia a simple dominant genetic inheritance, with high penetration, is postulated,[11] while Morquio's disease is recessively inherited.[15]

A study of the cases herein reported and a review of reports of other cases leads us to believe that Morquio-Brailsford disease and multiple epiphyseal dysplasia show overlapping of clinical and radiological manifestations. It is possible that they represent variations in the same entity—that is, a disturbance of epiphyseal development that is inherited and familial.

SUMMARY

Reports on three patients with osteochondrodystrophy of the Morquio-Brailsford type are presented. They were members of a Japanese family in which both parents were normal and there were four normal siblings. Two of the patients were twins, apparently binovular.

Clinically these patients were dwarfs, having short neck, flat nose, dorsal kyphosis, horizontal sternum, coxa vara, genu valga and pes planus. They walked with a duck waddle. Intelligence was unimpaired. Muscular weakness was present.

Radiographically there was widespread disturbance of normal epiphyseal development characterized by defective growth and fusion. A generalized bone demineralization was present and the vertebral bodies were flattened. Secondarily there were subluxations in the weight-bearing joints, accompanied by degenerative osteoarthrosis.

1090 Lincoln Avenue, San Jose (Smith).

REFERENCES

1. Brailsford, J. F.: Chondro-osteo-dystrophy, J. Bone & Joint Surg., 34-B, 153, 1952.

2. Brailsford, J. F.: Chondro-osteo-dystrophy: Roentgenographic and clinical features of child with dislocation of the vertebrae, Am. J. Surg., 7:404-410, Sept. 1929.

3. Caffey, J.: Gargoylism (Hunter-Hurler disease, dysostosis multiplex, lipochondrodystrophy), Am. J. Roent., 67: 715-731, 1952.

4. Caffey, J.: Pediatric X-ray Diagnosis, The Year Book Publishers, Chicago, 3rd Ed., 1956.

5. Coward, N. R., and Nemir, R. L.: Familial osseous dystrophy: Morquio's disease, Am. J. Dis. Child., 46:213, 1933.

6. Fairbank, H. A. T.: An Atlas of General Affections of the Skeleton, E. & S. Livingston, Ltd., Edinburgh & London, 1951.

7. Fairbank, H. A. T.: Chondro-osteo-dystrophy: Morquio-Brailsford type, J. Bone & Joint Surg., 31-B, 294, 1949.

8. Hirsch, S.: Generalized osteochondrodystrophy: The eccentroplastic form, J. Bone & Joint Surg., 19:297, 1937.

9. Hunter, C.: Rare disease in two brothers, Proc. Roy. Soc. Med., 1916-1917, 10 Sect. Stud. Dis. Child., 104-116.

10. Hurler, G.: Ueber einen Typ. multipler Abartungen vorweigend am Skelletsystem, Ztschr. fur. Kinderhalter., 24:220-234, 1920.

11. Jackson, W. P. U., Hanelin, J., and Albright, F.: Metaphyseal dysplasia, epiphyseal dysplasia, diaphyseal dysplasia and related conditions, A.M.A. Arch. of Int. Med., 94:886-901, Dec. 1954.

12. Morquio, L.: Sur Une Forme de Dystrophie Osseuse Familiale, Arch. de Medicine des Enfants, 32:139, 1929.

13. Pohl, John F.: Chondro-osteodystrophy (Morquio's disease), J. Bone & Joint Surg., 21:187, 1939.

14. Toma, J. J.: True chondro-osteodystrophy (Morquio's disease), S. Clin. N. Am., 33:1765-1774, Dec. 1953.

15. Whiteside, J. D., and Cholmeley, J. A.: Morquio's disease, Arch. Dis. Child., 27:487-497, Oct. 1952.

16. Zellweger, H., Giaccai, L., and Firzli, S.: Gargoylism and Morquio's disease, Am. J. Dis. Child., 84:421-435, Oct. 1952.