OSTEODYSPLASTY* (MELNICK AND NEEDLES SYNDROME)

REPORT OF A CASE

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The multiplicity of inherited skeletal dysplasias make their diagnosis difficult, especially in rare or atypical cases. A problem of this kind was posed about 2 years ago by a 50-year-old woman† who presented many osseous deformities, which we were unable to classify until, about 4 months after we first saw her, Melnick and Needles (1966) described several members of two families who presented exactly the same clinical picture as our patient. According to these authors this was a new syndrome, and this opinion we share.

Case Report

A married woman aged 50 years consulted us in February, 1966, because of pain in the right hip which had developed progressively for the past year. During infancy difficulty in walking had led to the discovery of osseous deformities, and during childhood she was treated for rickets. She had her first menses at 13 years and married at 24. Her first pregnancy, 3 years later, ended in a premature delivery in the seventh month. Delivery was difficult, requiring anaesthesia and forceps, and the baby died after 2 weeks. Soon afterwards a new pregnancy ended in the seventh month in haemorrhages and foetal death. She was dissuaded from having any further pregnancies and she adopted a child.

Her general appearance is striking because of the many morphological abnormalities, although her general health is good, she is of normal intelligence, and her sight and hearing are good. The upper arms are short in contrast with abnormally long forearms and hands, a lengthened trunk, and narrow shoulders. The face is chubby and red (Fig. 1) with pimples and a receding chin (Fig. 2), surmounted by a high forehead. There is some degree of asymmetrical exophthalmos, predominating on the left side. The irregular teeth required much treatment and were finally replaced by dentures.

Because of the narrow shoulders (biacromial diameter = 32 cm.) and the long neck, the head (circumference = 57 cm.) seems too large compared with the width of the body. The height (1.55 m.) is normal and the weight (61 kg.) slightly excessive. The arms (Fig. 3) are short and sagittally bowed with a posterior concavity. The forearms turn away from the trunk. Extension of the elbows is limited and the wrists seem thick, but the hands

are normal except for the short distal phalanges of the thumbs (Fig. 4).

The bitrochanteric diameter is 35 cm. Flexion of the right hip is limited to 90°, and the other movements are also diminished and painful. The left hip seems to be normal.

There is bilateral genu-valgum (Fig. 5), but no other deformities of the lower limbs. There is no hyperlaxity of the muscles.

Radiological Findings.—The x-ray opacity of the skull is increased; the base is dense, the vault thickened, and the frontal and maxillary sinuses small. The horizontal branch of the mandible is hypoplastic and slightly curved upwards, and the angle is very wide. Micrognathia has produced a marked overbite.

The spine shows right dorso-lumbar scoliosis with slight axial rotation and disappearance or even inversion of the sagittal physiological curves. An asymmetrical collapse of the third lumbar vertebra, with local diskarthrosis, cannot be explained by any anterior traumatic injury; the upper lumbar and lower dorsal spine (Fig. 6) show similar deformities, and a concavity of the central portion of many vertebral bodies produces a doubled-back appearance.

Fig. 6.—Deformities of dorsal spine.

* Given at a meeting of the Heberden Society in November, 1967.

† Another case has been observed by one of us (P.M.) (Maroteaux, Chouraki, and Coste, 1968).

OSTEODYSPLASTY

Fig. 1.—Red chubby face.

Fig. 2.—Receding chin.

Fig. 4.—Appearance of hands.

Fig. 3.—Short arms.

Fig. 5.—Bilateral genu valgum.

The most striking abnormality is the increased height of many lumbar and cervical vertebrae (Fig. 7), chiefly of the axis, atlas, and occipital condyles, so that the distance between the top of the odontoid process and the skull is increased (Fig. 8).

Fig. 7.—Cervical and lumbar vertebrae.

Fig. 9.—Skull and cervical vertebrae.

Fig. 8.—Odontoid process and skull.

The odontoid process appears massive; the distance between this and the atlas lateral bodies is increased, and these bodies themselves are broadened (Fig. 9).

The ribs are remarkably wide throughout their length (Fig. 10) with narrowing near their vertebral attachment. Irregular constriction and contours produce a distorted ribbon-like appearance. The scapulae are shortened in their vertical diameter, with thickened, bulging edges. The clavicles are irregularly bowed, with widening of the medial end.

Fig. 10.—Wide ribs.

The humeral shafts show marked antero-posterior bowing, with anterior concavity and a less marked lateral bowing (Fig. 11) which is responsible for an apparent cubitus valgus; the *x* rays show that in fact the axis of the elbow is correct. The humeral heads are hypertrophic and elongated, and much exceed the hypoplastic glenoid cavity with mild arthritic changes (Fig. 12).

Fig. 11.—Bowling of humeral shaft and elbow joint.

Fig. 12.—Humeral head.

Marked bowing of the radii and ulnae produce an *S*-shaped appearance in the antero-posterior *x* ray (Fig. 13), the physiological curves of these bones seeming to be exaggerated. All three bones of the arms show irregularities with rather *bright* and enlarged metaphyses.

Fig. 13.—Bowling of radii and ulnae.

The distal phalanx of the thumbs is very short, so that its length is less than half that of the proximal phalanx. The first metacarpal bones are bowed and the other metacarpals show a little reverse bowing (Fig. 14).

Fig. 14.—Hands.

The iliac bones are flattened in the area of the acetabulum and flared at the crest, with a little external *horn* on the right side. The narrowed and triangular superior pelvic opening (Fig. 15) was responsible, according to the obstetrician, for the dystocia. The pubic bones and

ischium are hypoplastic, the obturator foramen being distorted and flattened. The osteo-arthritis of the right hip, for which the patient first consulted us, shows supero-external narrowing and adjacent osseous condensation, with some excentration of the femoral head and osteophytosis of the fossa acetabuli. The vertical position of both femoral necks, with a cervico-diaphyseal angle of 180° , produced marked bilateral coxa-valga (Fig. 15).

Fig. 15.—Pelvis and hip joints.

The lower femoral metaphyses are widened and triangular and show up unusually clearly in the x rays (Fig. 16).

Fig. 16.—Lower femoral metaphyses.

The lowering of the internal femoral condyle is increased, which explains the discreet genu-valgum. The tibiae show the same S-shaped appearance (Fig. 17) as the other long bones, but only in the frontal, not in the sagittal plane, and also the same irregularity of cortical thickness, the epiphyseal widening, radiographic brightness, and cortical thinness.

Fig. 17.—Bowed tibiae.

The first metatarsal of the right foot is straight, but the other metatarsals show the same bowing as the metacarpals. The first metatarsal of the left foot is a little curved.

Laboratory Findings.—Tests included blood urea, sugar, calcium, phosphorous, uric acid, cholesterol, alkaline phosphatase, electrophoresis, sedimentation rate, blood count, Bordet-Wassermann reaction, and urinary acid mucopolysaccharides, and gave normal results. Caryotype, studied by Prof. Jérôme Lejeune, was also normal.

Family History.—This remains incomplete. The 70-year-old mother suffered from bilateral coxa-valga complicated by coxarthrosis on the right side. X rays of the skull, spine, forearms, and legs showed no abnormalities. We could not examine the sister of our patient, but she was said to have no complaints.

Progress.—On February 12, 1967, spontaneous luxation of the right eye occurred suddenly and was immediately reduced by the patient's physician without sequelae. She was then examined by an ophthalmologist but he could find no ocular lesion. We feel that the exophthalmos was produced by orbital and retro-orbital osseous changes. After the first examination the patient

experienced more severe pain in the hips and spine, and an operation was performed on October 19, 1967.

Surgery.—We intended initially to carry out Pauwel's osteotomy to correct the coxa-valga, but the surgeon advised against it because abduction of the hip aggravated the pinching between the femoral head and acetabulum; an osteo-plastic supra-acetabular graft was therefore carried out.

Discussion

The chief signs observed in our patient, and in those of Melnick and Needles, include condensation of the skull, hypoplasia of the mandibles, lengthening and deformities of many vertebrae, deformities of the flat bones (scapulae, pelvic bones, ribs, clavicles), lack of tubulation of the long bones with S-shaped bowing, cortical irregularities, metaphyseal flask-like clubbing, coxa-valga, hypertrophic deformity of the humeral heads, shortness of some phalanges, and exophthalmos.

The number and variety of these skeletal abnormalities and the difficulty of reducing them to a common denominator have led us to propose the comprehensive term "osteodysplasty".* Apart from the peculiar skeletal picture, the lack of visceral and biological disturbances eliminates the acquired bone diseases, osteopathies of endocrine and metabolic origin, and ricketts (including vitamin-refractory forms) (Coste and Bader, 1955).

The presence since infancy and the symmetrical skeletal involvement suggest that this is a congenital disorder of skeletal growth, an idea supported by the familial observations of Melnick and Needles. The disease seems unquestionably to be genetic in origin and is probably autosomal, but its expression may be variable. The first family studied by Melnick and Needles included three cases which reproduced all the signs seen in our patient; in two other cases some signs were lacking, some bones being spared; in four further cases the signs were minimal, being limited to hypoplasia of the mandible and of one or two phalanges. The diagnosis of such incomplete forms remains impossible without the family history. Of a total of eighteen members of the two families, Melnick and Needles found "13 of these (9 females and 4 males) showing some degree of involvement" and "the roentgenographic and clinical findings were practically identical in both families."

Another reason for adopting the term "osteodysplasty" is the difference between this syndrome and the other known congenital skeletal diseases. "Osteodysplasty" has, to all appearances, nothing in

common with various kinds of chondrodystrophy (achondro- or dyschondroplasty, polyepiphyseal dystrophy, and so on), nor with regional malformations (such as the dysostotic syndromes of the skull and face).

The connexion between "osteodysplasty" and congenital osteocondensing diseases, perhaps requires more discussion:

(a) *Albers-Schönberg's osteopetrosis* includes metaphyseal clubbing and occasionally coxa-valga; but in that usually recessive disease the osseous condensation is generalized, with transverse striae, osseous fragility, anaemia, and compression of the nerves in narrowed osseous channels.

On the other hand, many of the deformities seen in "osteodysplasty" are lacking in osteopetrosis.

(b) *Pycnodysostosis* (Maroteaux and Lamy, 1962) includes osteocondensation, a big head, hypotrophic mandibles with dental complications, and hypoplastic distal phalanges of some fingers. But many of the deformities of osteodysplasty are lacking and the condition includes osseous fragility and nanism.

(c) *Camurati-Engleman disease* has nothing in common with osteodysplasty except basal density of the skull (Joseph, Lefebvre, Guy, and Job, 1958) and, in the case of Riley and that of Neuhauser, Shwachman, Wittenborg, and Cohen (1948), bilateral coxa-valga.

(d) Weismann-Netter and Stuhl (1954) described a *toxopachyosteosis* mainly recognized by marked pseudorachitic sagittal bowing of the tibiae and tibialized fibulae with diaphyseal thickening, not observed in osteodysplasty (Nicholas, 1959; Breuzard, Tixier, and Sallet, 1960; Humbert, 1961; d'Halluin, 1962). Other signs occasionally associated are scoliosis and lumbo-sacral hyperlordosis, and nanism is a common feature.

One may perhaps wonder whether two patients reported as cases of toxopachyperiostosis by Larcen, Cayotte, Gaucher, and Bertheau (1963), unaware of Melnick and Needles' work, and presenting skull condensation, femoral, humeral, and radiocubital bowing, and rib widening, are not more probably examples of "osteodysplasty".

(e) More similarities exist perhaps between osteodysplasty and familial metaphyseal dystrophy (Pyle, 1931) and the syndrome described by Jackson, Albright, Drewry, Hanelin, and Rubin (1954).

(i) In Pyle's cases we find many osseous deformities: S-shaped bowing of tibiae, metaphyseal clubbing, demineralization, cortical thinning, widening of the anterior parts of the ribs, clavicles, metacarpal

* This compound derives from the Greek *πλάσσειν* = to mould or fashion, cf. *πλαστικός* = moulded, formed. It conveys a special meaning of "badly formed", which is more precise than the general term "dysplasia".

bones, and juxta-epiphyseal areas of the phalanges—that is to say tubular defects of bone—but without osteocondensation or vertebral involvement.

(ii) Jackson and others (1954) added cranial and generalized osteosclerosis to Pyle's syndrome.

Such comparisons demonstrate links between these latter syndromes (*i, ii*), the rarity of which has hindered attempts at detailed description, so that one may ask whether these apparently related diseases simply represent more or less typical forms of the same condition.

"Osteodysplasty" would perhaps embrace some of these rare diseases, but it must be kept in mind that clinical dissimilarities between linked diseases set the student of genetics very difficult but exciting problems.

Summary

The case is presented of a woman aged 50 years with a rare form of skeletal dysplasia. The existence of bone disease had been recognized in infancy when she started to walk. Later, normal childbirth proved impossible because of pelvic contraction. She first complained of pain due to osteoarthritis of the lumbar spine and right hip joint.

The main features of her appearance were exophthalmos, a high forehead, full red cheeks, and a receding chin. Her height was normal.

Radiological examination showed curvature of the long bones of the limbs, with irregular cortex, widening, and thinning of the metaphyses. In the skull the bone texture was dense. The ribs were irregular, tortuous, and ribboned, and the clavicles, scapulae, and pelvis were also deformed. The femoral necks were in the same axis as the shafts, producing a form of coxa valga. The height of some of the vertebral bodies was greater than their diameter. The blood chemistry was normal.

This case resembles in every way those published in 1966 by Melnick and Needles which included nine from one family and three from another. The name "osteodysplasty" is proposed for this generalized disorder of bone modelling.

DISCUSSION

DR. J. A. COSH (*Bath*): I noticed in the x ray that the heart shadow was enlarged. Did this patient have an abnormal heart? Was the electrocardiogram normal?

PROF. COSTE: I think the heart was normal. The general health was normal and there were no signs of cardiac disease.

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**L'ostéodysplasie
(Syndrome de Melnick et Needles)**

RÉSUMÉ

Les auteurs présentent l'observation d'une femme de 50 ans atteinte d'une dysplasie squelettique très rare. L'existence d'un trouble osseux avait été reconnue dans l'enfance lors des premiers pas. Plus tard, deux grossesses ne pûrent être menées à bien du fait d'un rétrécissement du bassin. Enfin à 50 ans, la malade se plaint de douleurs en rapport avec une arthrose de la colonne lombaire et de la hanche droite. L'aspect de la malade est caractérisé par une exophtalmie, un front haut, des joues pleines, un menton fuyant. La taille est normale.

Les radios montrent une incurvation des os longs des membres avec irrégularité des corticales, élargissement et éclaircissement des métaphyses. Le crâne est densifié, les côtes irrégulières, tortueuses, rubannées. Les clavicules, les omoplates et le bassin sont également déformés. Les cols fémoraux sont dans le prolongement de la diaphyse, dessinent une coxa valga caricaturale. Enfin, certaines vertèbres paraissent plus hautes que larges sur la vue du profil. Les examens de laboratoire n'ont pas montré d'anomalies.

Cette observation ressemble trait pour trait à celles publiées en 1966 par Melnick et Needles qui portent sur 9 cas d'une même famille et 3 cas d'une autre. On propose le terme d'"ostéodysplasie" pour caractériser ce défaut généralisé de modelage des os.

**Osteodisplasia
(Síndrome de Melnick y Needles)**

SUMARIO

Los autores presentan la observación de una mujer de 50 años afecta de una displasia del esqueleto muy rara. La existencia de un disturbio óseo fué reconocida en la infancia desde los primeros pasos. Más tarde partos normales no fueron posibles a causa de una cadera estrecha. Finalmente, a los 50 años, la enferma aquejó dolores en relación con osteoartritis de la columna lumbar y de la cadera derecha. El aspecto de la enferma se caracteriza por una exoftalmia, una frente alta, mejillas llenas y un mentón atrasado. Su estatura es normal.

Las radiografías muestran una curvatura de los huesos largos de los miembros con irregularidad de las corticales, un ensanche y aclaramiento de las metáfisis. Los huesos del cráneo son densos, las costillas irregulares, tortuosas, cinteadas. Las clavículas, las escápulas y el pelvis se ven también deformados. Los cuellos femorales se encuentran en el mismo eje que la diáfisis dibujando una coxa valga caricaturesca. Finalmente, ciertas vertebras parecen más altas que anchas, vistas de perfil. Investigaciones de laboratorio no revelaron anomalías.

Esta observación se parece muchísimo a las publicadas en 1966 por Melnick et Needles acerca de 9 casos en una familia y 3 casos en otra. Se sugiere el nombre de "osteodisplasia" para caracterizar este defecto generalizado de moldura de los huesos.