DOMINANT INHERITANCE IN FAMILIAL GENERALISED ARTICULAR HYPERMOBILITY

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Hypermobility of joints is a feature of many clinical syndromes. It may also exist as a distinct familial disorder. This paper reviews the clinical features and family histories of patients with loose joints and postulates the existence of two separate, genetically determined conditions which are transmitted as autosomal dominant traits and which are characterised by extreme degrees of generalised joint hypermobility.

CASE REPORTS

Kindred 1—D. W., a white woman born in 1940, had been a professional contortionist since the age of seventeen. Her act involved extreme degrees of joint movement, but she did not need to follow a régime of exercises to retain her mobility. Even after several weeks of inactivity her articular laxity would remain unimpaired. Her general health was good and she had had no significant illness in the past. She had suffered no orthopaedic disability.

Examination revealed an intelligent young woman, 165 centimetres tall, weighing 51.7 kilograms. Her stance and gait were normal and she had no musculo-skeletal deformity. She possessed a remarkable degree of articular laxity. Active movements in both shoulder joints included abduction of 240 degrees, flexion of 220 degrees and extension of 90 degrees. The hip joints could be hyperextended 30 degrees, abducted 50 degrees, medially rotated 50 degrees and laterally rotated 110 degrees. The elbow joints could be hyperextended 10 degrees and the knee joints 15 degrees. The wrist and ankle joints were also lax, as were the small joints in the hands and feet.

One of her three sisters had marked articular laxity, as had her father. Her paternal grandfather and his brother had been loose-jointed performers in Buffalo Bill’s circus. None of these hypermobile individuals had any musculo-skeletal deformity or disability, and significant osteoarthritis did not develop in old age. The pedigree is shown in Figure 1, and D. W.’s abilities are illustrated in Figure 2.

The pedigree of Kindred 1, showing transmission through three generations. Arrow indicates propositus, black symbols represent affected individuals; : indicates deceased.
Kindred 2—C. R., a white woman, was born in 1920 with congenital dislocation of both hips, successfully treated in infancy by manipulation and plaster casts. She was troubled in infancy by extreme laxity of the ankles and tarsal joints. For this reason she wore surgical boots and arch supports until the age of twelve. Recurrent dislocations of both patellae occurred during childhood, and both elbow joints were dislocated in minor falls. When she was twenty-eight years old she began to be troubled by osteoarthritis of the hips. This problem became increasingly severe, and bilateral upper femoral osteotomies were performed when she was forty-six. She had always been aware of her articular laxity, but the movements of the hips and spine became limited by osteoarthritis during her twenties. At the time that she was examined, she remarked that it was only the pronounced hyper-extensibility of her knees that permitted her to tie her shoe laces. Her general health was good; there had been no serious illness in the past.

Examination revealed a middle-aged woman, 152 centimetres tall and weighing 53.5 kilograms. She had marked thoraco-lumbar kyphoscoliosis and walked with the aid of a stick. Movements of the hips and spine were restricted, but the other joints were very lax. In particular, the metacarpo-phalangeal joints of the fifth fingers could be extended to 90 degrees and the thumbs could be made to touch either surface of the forearm. Flexion and extension to 90 degrees was possible at the wrist, and the elbows and knees could be hyper-extended 15 degrees.

The skin was normal and the other systems were intact.

Loose-jointedness was present in other members of the kindred, and many of them had orthopaedic problems. These varied in degree and severity: in particular, pes planus and spinal kyphoscoliosis were well known family traits. The pedigree is shown in Figure 3.

DISCUSSION

It has been suggested that joint hypermobility might be a "graded trait" and that individuals with such hypermobility represent one end of the clinical spectrum of normal articular movements (Kirk, Ansell and Bywaters 1967). On the other hand, kindreds in which joint laxity has been inherited as an autosomal dominant were mentioned by Sturkie (1941), Carter and Sweetnam (1958, 1960) and McKusick (1966). Hass and Hass (1958) described the association of articular laxity and orthopaedic complications in a group of infants, terming the condition arthrochalasis multiplex congenita. They recognised that the disorder was congenital, but they did not observe a familial tendency.

The ability of members of Kindred 1 to perform as contortionists is indicative of their hypermobility, and the pedigree shows dominant transmission of the trait.
The pedigree of Kindred 2 also indicates that the disorder is transmitted by the autosomal dominant mode of inheritance. This is shown by the occurrence of the condition in five generations, with approximately equal numbers of affected and non-affected individuals and of affected and non-affected males and females.

Although the affected members of both kindreds were very loose-jointed, a significant difference between the two families was that orthopaedic complications were absent in Kindred 1, and frequent in Kindred 2. The consistency of stigmata within a family suggests that these disorders are different entities. Support for this viewpoint may be found in the contrast between the families which were reported by Sturkie (1941), in which no orthopaedic complications occurred, and those described by Carter and Sweetnam (1958, 1960), in which recurrent dislocations were common.

It is likely that the joint laxity in these families was due to an inborn abnormality of connective tissue, probably involving the collagen. The considerable variation in the clinical stigmata may indicate difference in the basic defects, due to different genes.

The value of delineation of these separate entities lies in the fact that the clinical course and incidence of complications varies greatly in these disorders. However, precise diagnosis will permit accurate prognosis.

SUMMARY

Two individuals with generalised articular hypermobility are described. There are many affected members in both kindreds, and the pedigrees indicate that the disorder is transmitted as an autosomal dominant trait.

Orthopaedic complications and deformities are common in one family but absent in the other. It is suggested therefore that the two disorders are distinct and separate genetic entities.

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REFERENCES