Metaphyseal-diaphyseal angle in Blount's disease

A 30-year follow-up of 13 unoperated children

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We analyzed the metaphyseal-diaphyseal angle in 13 patients with infantile Blount's disease, who had been followed without treatment during the entire growth period and without any form of realignment procedure in adulthood. On diagnosis at 23 (17–35) months of age, the metaphyseal-diaphyseal angle varied between 7° and 25°. At follow-up, most of the legs were almost straight. We found that the diagnosis of Blount's disease cannot be based solely on the metaphyseal-diaphyseal angle and that a bowed knee must be followed with repeated examinations before it can be decided whether treatment is needed.

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Morbus Blount is a disease of unknown etiology that affects the metaphysis, the growth plate and the epiphysis of the posteromedial aspect of the proximal tibia, resulting in a varus and internal torsion deformity (Blount and Milwaukee 1937). The diagnosis is based on the radiographic criteria of Langenskiöld and Riska (1964). In the early stage, it is radiographically difficult to distinguish between physiological bowing and Blount's disease. The metaphyseal-diaphyseal angle, described by Levine and Drennan (1982), was considered helpful in distinguishing cases that did not yet have the typical radiographic changes in Blount's disease. Some authors claim that Blount's disease is always progressive and that treatment with splints or surgery should begin without delay (Johnston 1990).

We have analyzed the metaphyseal-diaphyseal angle in 13 patients with Blount's disease, who have been followed without treatment and who have been reexamined after completion of growth.

Patients and methods

In 1973, 52 cases of the infantile form of Blount's disease in Sweden were collected and presented (Zayer 1973). In this material, 19 children (30 knees) were followed without treatment during the entire growth period. In 13 of these cases (9 girls), the original reports and radiographs were available for evaluation, and the patients followed until completion of growth. The disease was bilateral in 7 cases, giving 20 knees for evaluation.

The varus deformity had been detected at 11 (8–15) months of age and the first radiographic examination was made at 23 (17–35) months of age. The reexamination was made at 32 (25–48) years of age.

On primary radiographs, the angle between the femoral and tibial diaphysis (femorotibial angle) and the metaphyseal-diaphyseal angle of the tibia were measured (Figure 1). At reexamination, the femorotibial angle and the angle between the mechanical axis of the femur and the tibia (HKA hip-knee-ankle angle) were measured. The radiographs at follow-up were taken in the weight bearing position. The degree of arthrosis was estimated according to Ahlbäck (1968).

Results

At diagnosis, the femorotibial angle was 8° (0°–20°) of varus. All knees later had the characteristic signs of Blount's disease, according to Langenskiöld and Riska (1964). The metaphyseal-diaphyseal angle was 15° (7°–25°) (Table). In 10 knees, further measurements had been made before growth plate closure. In these cases, the metaphyseal-diaphyseal angle decreased to 7° (0°–14°).

On reevaluation at 32 (25–48) years of age, the HKA angle measured 5° (1°–12°) of varus in the legs with Blount's disease. The angle between the anatom-

Data on 13 cases with Blount's disease

A	B	C	D	E	F	G	H	I	J
1	F	21	25	R	15	22	2	-2	–
2	F	19	28	L	6	14	2	-4	–
				R	0	7	3	-3	–
3	F	26	26	L	[a]	14	6	-5	–
4	M	19	27	R	4	16	12	6	–
5	F	24	33	L	2	15	2	-3	–
6	F	22	31	L	5	15	5	-2	–
				R	10	19	5	-3	–
7	F	24	32	L	5	16	6	2	–
				R	3	10	4	-2	–
8	M	30	31	L	20	12	6	-1	+
				R	15	10	2	-5	–
9	M	19	31	R	[a]	14	9	7	–
10	F	18	33	L	16	15	8	5	–
				R	16	12	1	-6	–
11	F	17	32	L	10	8	2	-5	–
12	M	35	42	L	8	25	3	-2	–
				R	5	15	6	-2	–
13	F	26	48	L	7	21	1	-6	–
				R	5	12	1	-5	–

A Case
B Gender
C Age at first radiographic examination, months
D Age at follow-up, years
E Side of involvement
F Femorotibial angle at first examination
G Metaphyseal-diaphyseal angle at first examination
H Hip-knee-ankle (HKA) angle at reexamination
I Femorotibial angle at reexamination.
J Arthrosis
Positive angle measures varus, negative valgus
[a] Measurement not possible.

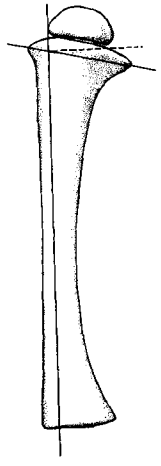

Figure 1. The metaphyseal-diaphyseal angle of the tibia.

ical axis of the femur and tibia varied between 6° valgus and 7° varus (mean 2° valgus). 1 knee showed moderate lateral arthrosis. None of the patients had been operated on with any form of realignment procedure.

Discussion

Levine and Drennan (1982) found that children with a metaphyseal-diaphyseal angle greater than 11° developed Blount's disease in 29 of 30 cases. Only 3 of 58 patients with a metaphyseal-diaphyseal angle of less than 11° developed Blount's disease. Feldman and Schoenecker (1993), however, found that one third of children with physiological bowing and a femorotibial angle of more than 10° had a metaphyseal-diaphyseal angle exceeding 11°. They recommended presumption of Blount's disease, if the metaphyseal-diaphyseal angle is more than 16°.

In our material, 4 of the 20 knees with Blount's disease had a metaphyseal-diaphyseal angle of 11° or less, and 14 knees had an angle of less than 16° (Table). At follow-up, most of the knees were almost straight with regard to the HKA angle and the angle between the anatomical axis of the femur and tibia.

There is controversy regarding treatment of Blount's disease. Some authors claim that the disease is always progressive and that treatment with splints or surgery should begin without delay (Johnston 1990). However, spontaneous improvement has been described (Langenskiöld and Riska 1964, Blount 1966). To our knowledge, no prospective randomized study evaluating splinting versus no treatment has been published. Having analyzed the 19 untreated cases from Sweden, Zayer (1973) concluded that spontaneous improvement can be expected before the age of 4 and, considering the results of the present study, we do not recommend treatment in these cases until repeated examinations have shown progress of the deformity.

We conclude that the metaphyseal-diaphyseal angle has a limited prognostic value for distinguishing between physiological bowing and Blount's disease. It must be stressed that in the individual case a single measurement of the metaphyseal-diaphyseal angle cannot be used to determine whether the bowing will be progressive, and require treatment. Even a bowing with a metaphyseal-diaphyseal angle over 20° can occasionally recover spontaneously (Figure 2). A varus knee must be followed with repeated examinations before a decision can be made as to whether the bowing needs treatment.

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Figure 2. Case 12.

A boy aged 3 years with bilateral infantile Blount's disease. Metaphyseal-diaphyseal angle 25° of the left and 15° of the right tibia.

The same patient at 42 years of age. The limbs are straight and pain-free. No arthrosis is seen, and there is a normal range of knee motion.

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