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TIBIA VARA (OSTEOCHONDROSIS DEFORMANS TIBIAE OR BLOUNT'S DISEASE)

Treatment and Follow-up Examination

By

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This disease was first mentioned in the literature by *Erlacher* in 1922. Since then many cases have been described particularly by Scandinavian authors.

In 1937 *W. P. Blount* collected 23 previously published cases, added 13 of his own, and gave a clinical, histological and roentgenological description of the condition.

Since then it has been considered as a disease entity with the name suggested by *Blount*: Tibia Vara or Osteochondrosis Deformans Tibiae. Subsequent literature included *A. Langenskiöld's* valuable contributions, both clinical and by animal experimentation.

SYMPTOMS

Both *Blount* and *Langenskiöld* describe an infantile and an adolescent group of patients. The infantile group consists of cases in which the varus deformity appears most frequently in the second year of life. In the adolescent group the varus deformity does not appear until the age of 6 to 8 years.

The dominating symptom is the varus position of one or both knee joints, where the deformity appears as a marked angulation at the proximal end of the tibia (Fig. 1).

Other symptoms and signs which may be present are pain in and instability of the knee joint, increased medial torsion of the leg, compensating planovalgus deformity in the foot and a shortening of the tibia.

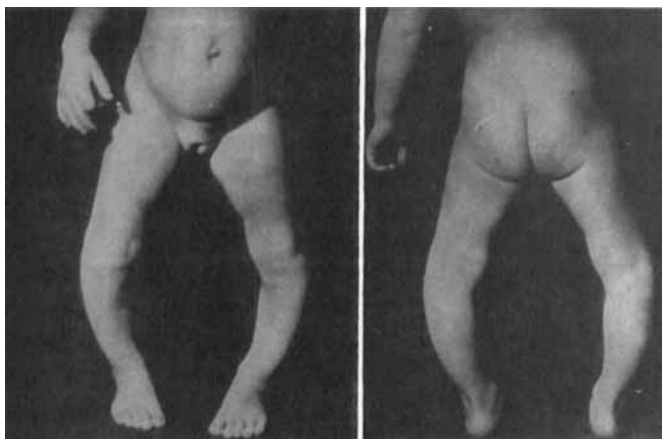


Fig. 1.

Blount's disease. Girl, 2½ years old (Case LK).



Fig. 2.

Fig. 2. X-ray appearance of Blount's disease. Girl 2½ years old (Case LK).—Note the normal outline of the epiphysis.



Fig. 3.

Fig. 3. X-ray appearance of Blount's disease. Girl 6½ years old (Case RJ). Note that the deformity also includes the medial part of the epiphysis.

Fig. 2 and 3 show typical X-ray findings in children with Blount's disease.

Histological examination of tissue taken from the medial part of the proximal metaphysis shows coarse, irregular trabeculae with islands

of cartilage interspersed. The normal columnar arrangement of the cells in the epiphyseal cartilage will be lacking.

PRESENT CASES

Our series consists of 17 patients treated at Sophies Minde, Oslo University Orthopaedic Hospital, during the period 1944–1961.

In Table 1 is found a survey of the 17 patients, 16 girls and one boy. There are 13 bilateral and 4 unilateral cases. 8 patients were operated once, 5 patients twice and 4 patients three times. In all 50 operations were performed on 30 affected extremities.

It may be of interest to note that in 2 patients, during the observation period, we found clinical and roentgenological signs of increased anteversion in collum femoris to such a degree that rotation osteotomy was indicated.

SURGICAL TECHNIQUE

The above-mentioned 50 operations performed to correct the varus deformity in the knees were carried out over a long period of time, from 1945–1961. A number of different surgeons have performed the operations and the technique has varied.

In the majority of cases an ordinary wedge osteotomy proximally on the tibia was done. In those cases where the torsion deformity was particularly severe, a simultaneous torsion correction was carried out.

During the first years no other post-operative fixation than a plaster cast was used. Because of sliding in the osteotomy area in a few cases fixation with one or more Blount staples was subsequently adopted. Our present technique, which was used in the majority of cases, is as follows: The fibula is exposed in a separate lateral incision below the collum. A section 1 cm. in length is resected subperiosteally. Two longitudinal incisions, slightly curved, give good access to the proximal end of the tibia from both sides. A wedge is removed on the lateral side of the tibia a little below the epiphyseal line, the base of the wedge posterolaterally. The wedge includes approximately $\frac{2}{3}$ of the diameter of the tibia. The rest of the diameter is cut straight through. It is now possible to correct the malposition in the frontal plane, as well as torsion abnormalities. In the opening medially and anteriorly a bone graft is inserted (autotransplant.). The corrected position is fixed by means of two or three staples (Fig. 4).

This method has resulted in few or no complications, very satisfactory correction and rapid healing of the bone.

TABLE 1
Data Collected from the 17 Cases which are Included in the Material.

Initials	Born	Sex	Uni- or bilat affect- ion	Age yrs		Deformity before operative treatment		Age yrs						Complications
				De- formity observed first time	Defi- nite diag- nosis	Rt	Lt	First operation		Second operation		Third operation		
								Rt	Lt	Rt	Lt	Rt	Lt	
RJ	1942	♀	Bil	1	7	Va 10°	Va 15°	7	7	17	13	...	...	Recurvation rt. leg. Reopr.
KMK	1942	♀	Bil	1½	3	Va 4°	Va 6°	3½	3½	...	...	...	...	
ME	1942	♀	Bil	1½	9	Va 28°	Vg 1°	9	9	16	16	...	...	
MN	1943	♀	Dx	1½	12	Va 12°	Va 12°	12	...	...	...	...	...	
GM	1943	♀	Bil	1½	4	Va 12°	Va 21°	4	4	16	16	...	...	
AK	1943	♀	Sin	1½	8	Vg 4°	Va 13°	...	17	...	...	...	...	
BK	1944	♀	Sin	1½	4	Vg 4°	Va 6°	...	4	...	...	...	...	
LKW	1944	♀	Dx	1½	5	Va 4°	Va 4°	9	...	...	...	...	...	
IR	1944	♀	Bil	1½	11	Va 2°	Va 4°	11	11	16	16	...	18	
VG	1945	♀	Bil	1½	8	0°	Va 5°	...	9	...	...	...	...	
LK	1946	♀	Bil	1½	1½	Va 29°	Va 27°	3	3	...	...	...	...	
KF	1948	♀	Bil	1½	1½	?	Va 11°	5	5	9	9	11	11	Post-opr. paresis n. fib. dx. + recurva- tion. Reopr.
IJK	1948	♀	Bil	1½	7	Va 26°	Va 2°	7	...	11	...	13	...	
TL	1950	♀	Bil	1½	1½	Vg 6°	Va 11°	...	8	11	11	...	...	
AMR	1951	♀	Bil	6	9	Va 4°	Va 3°	11	10	...	...	...	...	
HSA	1951	♂	Bil	1½	4	Va 47°	Va 57°	5	5	8	8	11	11	
GH	1951	♀	Bil	1½	4	Va 15°	Va 15°	6½	6½	8	8	...	...	Post-opr. paresis n. fib. dx.



Fig. 4.

Postoperative X-ray of Blount's disease. Girl 10 years old (Case TL). Note fixation with Blount staples and bone graft medially.

COMPLICATIONS DUE TO OPERATION

We have had two types of complications following this operation. One is sliding between the two fragments, the other is paralysis of the fibular nerve.

Sliding has not occurred since we started using fixation with staples in addition to a plaster-cast.

We have not had any case of fibular paralysis since we started resection of the fibula through a separate incision on the lateral side.

Delayed union has never been observed.

RESULTS OF THE TREATMENT

A survey of the present cases reveals that only in a few cases has permanent correction been obtained by a single operation. This is not surprising, since the operation only entails a mechanical correction and influences neither the disease itself nor its cause.

Consequently, in evaluating the results it is necessary to follow the patient from the onset of the first symptoms until the epiphyses are closed at the approximate age of 16.

It was therefore decided to present the results of treatment only of patients who had reached the age of 16 at the follow-up examination in 1962.

TABLE
Data Collected from 11 Cases at Follow-up

Initials	Sex	Affec- tion	Position of knee before treatment		Number of operations		Age at first operations		Follow-up				
			Rt	Lt	Rt	Lt	Rt	Lt	Age	Subjectiv discomfort		Physi- cal activity	Range of motion knee- joints
										Rt	Lt		Rt Lt
RJ	♀	Bil	Va 10°	Va 15°	2	2	7	7	20	—	—	Full	Normal
LK	♀	Bil	Va 29°	Va 27°	1	1	3	3	18	—	—	Full	Normal
BK	♀	Sin	Vg 4°	Va 6°	...	1	...	4	18	Slight			
KMK	♀	Bil	Va 4°	Va 6°	1	1	3	3	20	—	—	Full	Normal
LKW	♀	Dx	Va 4°		1	...	9	...	18	—	—	Full	Normal
VG	♀	Bil	0°	Va 5°	...	1	...	9	17	—	—	Full	Normal
MN	♀	Dx	Va 12°	?	1	...	12	...	19	—	—	Full	Normal
GM	♀	Bil	Va 12°	Va 21°	2	2	4	4	19	Slight		Full	Normal
IR	♀	Bil	Va 2°	Va 4°	2	3	11	11	18	—	—	Full	
ME	♀	Bil	Va 28°	Vg 1°	2	2	9	9	20	—	—	Full	Normal
AK	♀	Sin	Vg 4°	Va 13°	...	1	...	17	18	—	—	Full	Normal

Table 2 contains a description of these 11 patients. All are female, 7 affected bilaterally and 4 unilaterally. 7 are operated once, 3 are operated twice and 1 operated three times on the left side and twice on the right side.

At the time of the follow-up examination, all patients were between 16 and 20 years old. 10 were examined by the author, while information about the 11th is based on written information from the patient.

a. *Symptoms.*

9 patients reported that they have no functional discomfort in the knees. 2 reveal that they have slight discomfort from one knee in the nature of stiffness in the joint and muscle pain in the thigh following strenuous activity. One of these has increased anteversion of the femoral neck. It is noteworthy that none have discomfort which keeps them from any physical activity common to their age group.

Regarding the cosmetic result, 8 patients report that they are satisfied, 3 are dissatisfied.

b. *Signs.*

(Only 10 patients were examined by the author.)

Normal range of motion can be observed in all those examined. Only

2

after Closing of the Epiphyseal Plate.

examination											
Position of knees after treatment		Tortion-deformity of legs		Instability of kneejoints		Cosmetic result	Shorting of legs		X-ray deformity of kneejoints		Functional cosmetic and prognostic result
Rt	Lt	Rt	Lt	Rt	Lt		Rt	Lt			
Vg 5°	Vg 4°	—	—	—	—	Good	—	—	—	+	Good
Vg 3°	Vg 5°	—	—	—	—	Good	—	—	—	—	Excellent
						Fair					
Vg 1°	Va 1°	—	—	2°	4°	Good	—	—	—	—	Good
Vg 2°	Vg 1°	—	—	—	—	Good	—	—	—	—	Excellent
Vg 1°	Vg 2°	—	—	—	—	Good	—	1 cm	—	—	Good
Va 4°	Vg 5°	+	—	2-3°		Fair	1.5 cm	—	—	—	Fair
Vg 8°	Vg 5°	+	—	3°	2°	Good	—	—	—	—	Good
Vg 11°	Va 2°	+	—	2-3°	3-4°	Good	—	—	+	++	Good
Vg 11°	Va 2°	—	+	2°	—	Fair	—	—	++	+	Fair
Vg 4°	Vg 2°	—	+	—	2-3°	Good	—	1 cm	—	+	Fair

4 have normal stability of the knees, while the remaining 6 have a slight degree of instability upon weight bearing.

5 of 10 have normal leg torsion. The others have increased medial torsion in one or both leegs. The length of the legs is the same in 7, while 3 have shortening of one affected leg varying from 1-1.5 cm.

Upon roentgenological examination a satisfactory degree of valgus was found in 7 of the 10 patients.

The remaining had varus position varying from 0-4 degrees in one or both knees. It may also be mentioned that 4 patients had an incompletely developed medial tibial plateau, roentgenologically judged.

Considering all the above-mentioned signs and symptoms, one is left with the impression that in only 2 of the cases have completely satisfactory results been obtained. In 5 cases the result must be considered satisfactory, while 3 cases are not completely satisfactory. In the latter cases arthrotic changes in the knee at a comparatively young age must be anticipated.

As shown in Table 3, one finds at present in 2 patients a range of rotation of the hip joints which indicates increased anteversion of the neck of the femur, an observation which is confirmed by roentgenological observation. A corrective rotation osteotomy was performed earlier on one patient.

TABLE 3
Range of Rotation of Hip-joints at Follow-up Examination.

Range of rotation of hip-joints in degrees			Rt	Lt
LK	18 years	Internal	60	60
		External	30	30
RJ	20 years		Unknown	
VG	17 years	Internal	45	— 25*
		External	30	— 50
GM	19 years	Internal	85	— 85
		External	0°	— 0°
IR	18 years	Internal	70	— 70
		External	20	— 20
KMK	20 years	Internal	70	— 70
		External	35	— 35
MN	19 years	Internal	70	— 60
		External	10	— 20
ME	20 years	Internal	90	— 5**
		External	5	— 50
LKW	18 years	Internal	60	— 65
		External	40	— 35
AK	19 years	Internal	65	— 60
		External	40	— 35
BK	18 years		Unknown	

* Rotation osteotomy performed.

** Untreated slipped epiphysis lt. femoral neck.

DISCUSSION

1. *Clinical Classification of the Patients.*

In the present series the diagnosis is frequently not established with certainty until the children are 6 years old or more, but we have reliable information that varus has been present from the age of 1–2 years. This pertains to all patients except one. In this case the information regarding the first years was indefinite. The subsequent course would indicate that this patient too belongs in the infantile group. It therefore seems reasonable to assume that in this series, which has been collected over a period of years, all cases must be included in the infantile group.

2. *Clinical Signs and Symptoms.*

It is evident from the case histories of our patients that until the age of 6 the varus deformity is the only subjective symptom of the disease.

Only in children 6 years old or more are there complaints of pain and instability of the knees, and not until this age will a difference in length develop which is of functional importance.

One must therefore assume that the subjective symptoms in Blount's disease imply a comparatively longlasting weight bearing in varus position of the knee.

This is undoubtedly of importance for the choice of treatment. A varus deformity ought to be corrected surgically before the subjective symptoms appear. Longterm weight bearing in varus should be avoided.

3. *Etiology.*

During treatment of our patients with genu varum one noticed many years ago that the deformity of the knees in some of the patients was combined with an increased anteversion of the femoral neck. In two cases the operative correction of the malposition of knees was supplemented with a rotation osteotomy performed below the trochanter of the femur.

At the follow-up examination one found, in addition to these two patients, clinical signs of increased anteversion in one patient, and also one patient who had this deformity in the right hip combined with an untreated epiphyseolysis in the left hip joint.

The high frequency of increased anteversion in the present study may suggest that the two deformities have common etiological factors, a hypothesis which receives support from other observations.

4. *Method of Operation and Related Complications.*

In the literature one finds a surgical technique described in which the tibia osteotomy is performed along an inclined or curved plane. This should lead to a more successful correction of the varus as well as the torsion deformity. Our surgical technique, which has been described previously, is easy to perform, and in our opinion the resulting correction is entirely successful.

5. *Late Results of Treatment.*

At the time of the follow-up examination an attempt was made to answer many different questions concerning the knees and lower extremities of the patients.

The sum total of these evaluations forms the basis for the following classification of the final result (see Table 2) :

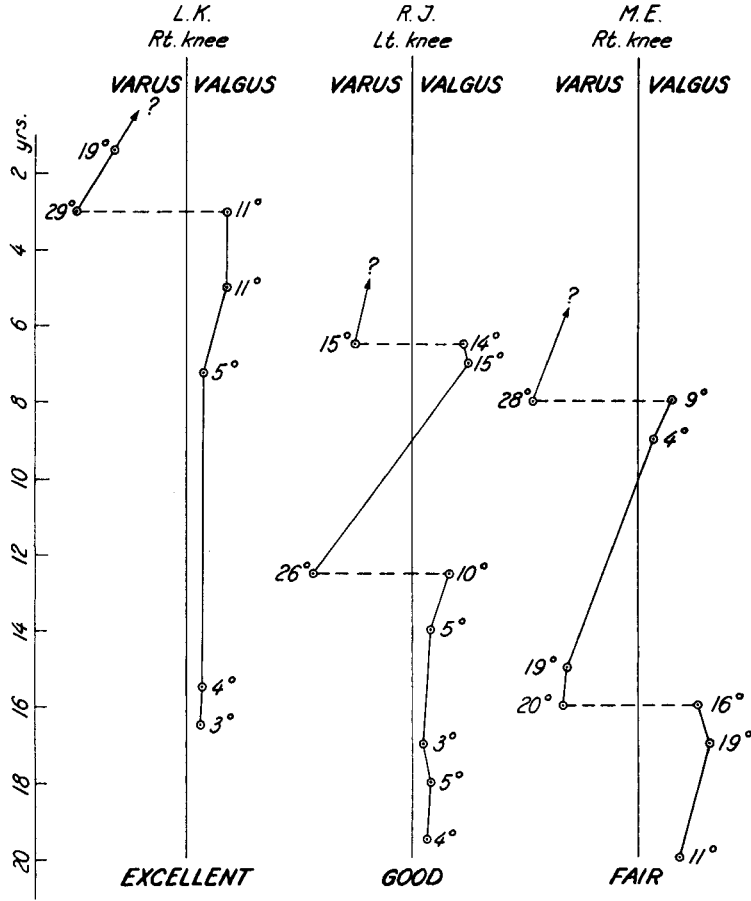
Excellent	2
Good	5
Fair	3

In this connection “Excellent” means that the patient had no sequela whatsoever following the disease.

“Good” means that the patient herself is satisfied, but that examination may reveal mild sequela.

“Fair” means that the patient as well as the medical examiner notice mild sequela. Functionally speaking, these sequela are of no importance at present, but one predicts that they may lead to early arthrosis in the knees.

TABLE 4
Spontaneous and Operative Change in Axis of Knee-Joint in Three Patients.



In Table 4 an attempt is found at a graphic presentation of the course of the disease in one patient from each of the 3 groups "Excellent", "Fair" and "Good".

For the sake of clarity, only one knee from each patient is included.

This graphic presentation well illustrates the information revealed by the follow-up examination.

"Excellent": We achieved this result by early correction and by consistently maintaining the knee in a valgus position.

"Good": This result was achieved when the first correction was not performed until the age of 6 or 7, and when the second correction was delayed until an extensive varus had developed.

"Fair": This result was achieved when the first corrective operation was performed at the age of 8 or 9 and when afterwards the patient was exposed to longlasting weight-bearing in varus position. This conduct of the treatment easily leads to a permanent deformation of the medial part of the knee-joint.

6. *Conservative Treatment.*

In our series there are no cases treated conservatively. In progressive Blount's disease, the conservative treatment must of necessity be of long duration. It ought perhaps to be combined with nonweight-bearing of the affected extremity. Under these conditions it is doubtful whether conservative treatment is, from the patient's point of view, preferable to surgical treatment even though, during the growth period, 2 or 3 osteotomies may be necessary.

On the other hand, in milder cases the patient is treated according to the subsequent development. Not until definite progression is established is surgical correction indicated. Mild cases with spontaneous remission need scarcely any treatment, but should be kept under close observation.

SUMMARY AND CONCLUSIONS

A series of 17 patients with Blount's disease was followed through the period of growth. All patients were surgically treated.

At the last follow-up 11 patients had reached the age of 16 when the epiphyseal plate was closed and a final evaluation of the treatment was made possible.

Admittedly, the small number of patients somewhat limits the value of general conclusions which may be reached on the basis of the

reported results. With this reservation the following suggestions for the treatment plan in cases with Blount's disease may be given:

1. As soon as the diagnosis is made with certainty, and the disease seems to be progressive, surgical correction of the varus position should be performed at an early age (3-4 years).

2. If the disease shows further progression, reoperation should be carried out at such short intervals that the patient will not have weight-bearing in varus position of the knee joint for any length of time.

3. When operating, one should try to achieve sufficient overcorrection (10-20 degrees valgus). In this way one prevents two injurious factors from simultaneously deforming a growing joint: the osteochondrosis on one side and the weight-bearing in varus position on the other.

4. During the treatment period one should be aware of the possibility of a simultaneously appearing increased anteversion of the femoral neck which may require treatment.

RESUME ET CONCLUSIONS

Une série de 17 malades atteints de la maladie de Blount ont été suivis durant la période de la croissance. Tous les malades avaient été traités chirurgicalement.

Au dernier examen, 11 malades avaient atteint l'âge de 16 ans, c'est-à-dire le moment où la plaque épiphysaire est close et où il est possible de faire une évaluation finale du traitement.

Il faut reconnaître cependant que le petit nombre des malades limite la valeur des conclusions générales auxquelles on peut arriver sur la base des résultats rapportés. En prenant cette réserve, les suggestions suivantes peuvent être faites concernant le plan de traitement des cas de la maladie de Blount.

1. Aussitôt que le diagnostic a été posé avec certitude et que la maladie paraît progresser, il convient de pratiquer une correction chirurgicale en position varus à un âge précoce (3-4 ans).

2. Si la maladie semble poursuivre sa progression, une réopération doit être pratiquée à intervalles assez courts pour que le malade n'ait pas à supporter le poids du corps en position varus de l'articulation du genou pour une durée quelconque de temps.

3. En pratiquant l'opération, il convient de donner une surcorrection suffisante (10-20 degrés valgus). De cette manière, on évite deux facteurs préjudiciables pouvant simultanément déformer une articula-

tion en croissance: d'un côté l'ostéochondrose, de l'autre le poids du corps en position varus.

4. Durant la période du traitement, on doit songer à la possibilité de l'apparition simultanée d'une antéverson accrue de la tête fémorale qui pourrait exiger un traitement.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

Eine Reihenfolge von 17 Patienten mit Blounts Erkrankung wird während der Wachstumsperiode verfolgt. Alle Patienten waren chirurgisch behandelt worden.

Bei der letzten Nachuntersuchung hatten 11 Patienten das Alter von 16 Jahren erreicht, in dem die Epiphysenplatte geschlossen ist und eine endgültige Bewertung der Behandlung möglich ist.

Selbstverständlich begrenzt die kleine Zahl der Patienten bis zu einem gewissen Grade den Wert von allgemeinen Schlussfolgerungen, die auf Grund der berichteten Ergebnisse erreicht werden können. Mit dieser Einschränkung können die folgenden Vorschläge zur Behandlung der Blount'schen Erkrankung gemacht werden.

1. So bald eine sichere Diagnose gestellt ist und die Erkrankung fortschreitend zu sein scheint, sollte die chirurgische Korrektur der Varusstellung frühzeitig vorgenommen werden (mit 3-4 Jahren).

2. Wenn die Erkrankung weiterhin fortschreitet, sollte eine erneute Operation in so kurzem Intervall ausgeführt werden, dass der Patient das Kniegelenk nicht für längere Zeit in Varusstellung belastet.

3. Bei der Operation sollte man versuchen eine genügende Überkorrektur (10-20° valgus) zu erhalten. Dadurch verhindert man zweierlei schädliche Faktoren daran, dass sie gleichzeitig das wachsende Gelenk verbilden: Die Osteochondrose einerseits und die Belastung in Varusstellung andererseits.

4. Während der Behandlungsperiode sollte man auf die Möglichkeit einer gleichzeitig auftretenden vergrößerten Anteversion des Oberschenkelhalses achten, die unter Umständen ebenfalls Behandlung erfordert.

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