

## A STUDY OF BLOUNT'S DISEASE

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### ABSTRACT

#### BACKGROUND

In the year 1937, Walter Blount from Milwaukee gave description of this condition called tibia vara in his classic article. Blount described tibia vara as "an osteochondrosis of the medial side of the proximal tibial epiphysis." However, currently, tibia vara is considered an acquired disease of the proximal tibial metaphysis, rather than an epiphyseal dysplasia or osteochondrosis. This disease is characterized by an abrupt angulation of the proximal end of tibia into a progressive varus deformity.

The objectives of this study were to evaluate the clinical and radiological aspects of Blount's disease and to study various treatment options available and their results.

#### MATERIAL AND METHODS

This is retrospective study conducted in department of Orthopaedics, King George Hospital, Visakhapatnam, in patients who had been diagnosed with unilateral or bilateral Blount's disease during the period of 2012 to 2017, after obtaining permission from institutional ethics committee. Twenty-one patients were included in the sample. There were 13 females and 8 males. All the cases in the sample were radiological confirmed cases of Blount disease with a progressive bowing and a metaphyseal-diaphyseal angle of more than eleven degrees and were graded with Langenskiöld types. The adolescent group was further separated with early onset (8-13 years) and late onset (above 13 years).

#### RESULTS

Incidence of Blount's is more common in females left tibia was involved in eleven children. Internal torsion was same before and after osteotomies. Range of varus was 15 degrees to 50 degrees. Average m-d angle was 26 degrees. Grading of result was done on basis of femorotibial mechanical axis.

#### CONCLUSION

Langenskiöld grading has no prognostic effect. Metaphyseal-diaphyseal angle was useful in making diagnosis. There is no correlation between recurrence of varus deformity and preoperative deformity angle. Fixation with pins or staples is not a factor. Metaphyseal osteotomies have high incidence for recurrence, limb length discrepancy and subluxation of knee joint.

#### KEYWORDS

Blount's Disease, Osteotomy, Tibia Vara, Metaphyseal Diaphyseal Angle.

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#### BACKGROUND

In the year 1937, Walter Blount from Milwaukee gave description of this condition called tibia vara in his classic article. Blount described tibia vara as "an osteochondrosis of the medial side of the proximal tibial epiphysis." However, currently, tibia vara is considered an acquired disease of the proximal tibial metaphysis, rather than an epiphyseal dysplasia or osteochondrosis. This disease is characterized by an abrupt angulation of the proximal end of tibia into a progressive varus deformity. Obesity and age at the initiation of walking have more influence on the disease rather than any genetic and familial influence or an

enzymatic defect of bone growth. Weight-bearing must be necessary for its development since it is not seen in non-ambulatory patients.

Blount distinguished, according to age at onset, two types of tibia vara: infantile, which begins before 8 years of age, adolescent Blount disease has been divided into two types. (1) An adolescent form occurring between the ages of 8 and thirteen years caused by a partial closure of the physis after trauma or infection. (2) "Late -onset tibia vara that occurs in obese children, especially black children between the ages of 8 and 13, without a distinct cause. The radiological features are consistent. The medial half of the epiphysis as seen on roentgenograms is short, thin, and wedged; the physis is irregular in contour and slopes medially. The proximal metaphysis forms a projection medially. Langenskiöld<sup>1</sup> noted progression of epiphyseal changes and the deformity through six stages with growth and development. Levine and Drennan<sup>2</sup> reported that the metaphyseal-diaphyseal angle is an early indicator of Blount's disease.

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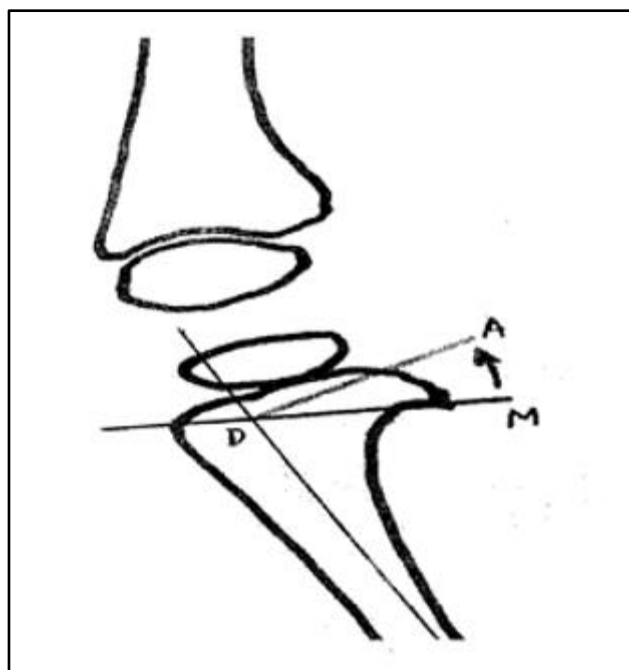
Bracing is the nonoperative treatment in Blount's disease, and does not always accomplish this goal. However, a trial with a brace before the child is three years old does not seem to compromise the results of tibial osteotomy. Metaphyseal osteotomies, medial plateau elevation, epiphysodesis, distraction osteogenesis, have been described to correct the deformities. Focal fibre cartilaginous dysplasia has been reported as a cause of tibia vara in a few patients. Bell<sup>3</sup> described the characteristic roentgenographic appearance and unilateral nature of this lesion of the proximal medial metaphysis. Later reports suggest that this generally is a self-limiting condition that corrects spontaneously, and that severe progression should be documented before valgus osteotomy is performed.

#### *Aims and Objectives*

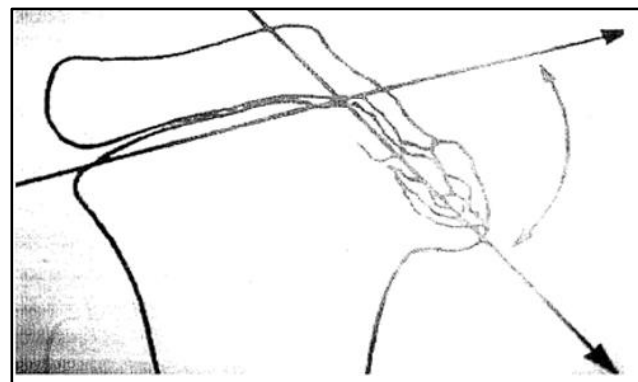
The main objective is to examine the influence of personal (demographic, and genetics), perinatal and other clinical features on (retrospective) Blount's disease. Further, the study also proposed to evaluate the treatment procedures of Blount's disease having with specific objectives in the prognosis, of Blount's disease.

#### **MATERIALS AND METHODS**

This is retrospective study conducted in Department of Orthopaedics, King George Hospital Visakhapatnam in patients who had been diagnosed with unilateral or bilateral Blount's disease during the period of 2012 to 2017, after obtaining permission from institutional ethics committee. Twenty-one patients were included in the sample. There were 13 females and 8 males. All the cases in the sample were radiological confirmed cases of Blount disease with a progressive bowing and a metaphyseal- diaphyseal angle of more than eleven degrees and were graded with Langenskiold types.



**Figure 1. Metaphyseal- Diaphyseal Angle**



**Figure 2. Medial Physeal Slope**

The children with Blount's were classified into two groups namely Infantile and adolescent. The adolescent group was further separated with early onset (8-13 years) and late onset (above 13 years). Thus, there were fifteen cases of infantile variety, six cases of adolescent early onset, and none in the late onset group. Thirteen children had unilateral involvement, and eight children had bilateral involvement. Among those with unilateral involvement ten children with (left) tibial involvement and three children with right tibial involvement were there in the sample.

Case notes and roentgenograms collected from hospital records were mainly considered in the present investigation. In the review of each patient, the information regarding the birth details, immunization, milestones, and the weight of the child was collected. On local examination the hips, knees were examined for range of movements and other details required in the prescribed. The tibia-femoral and tibial metaphyseal-diaphyseal angles were measured on all of the roentgenograms. The tibial metaphyseal diaphyseal angle as described by Levinine and Drennan lies between a line that connect the medial and lateral beak of the tibial metaphysis and a line perpendicular to the lateral cortex of the tibia. All the available preoperative roentgenograms were examined and measured for femoral tibial angle, Metaphyseal diaphyseal angle, angle of medial slope, Langenskiold grade<sup>4</sup> and presence of any abnormal epiphysis was noted.

#### *Complications*

The complications developed were noted from the records, which were the kind of immediate and delayed. The immediate or early complications noted from the records were foot drop, swelling and numbness. The delayed were wound healing, recurrence of deformity, and correction of angle of medial slope, correction of metaphyseal-diaphyseal angle, leg length discrepancy, joint subluxation and painful joints.

#### *Outcome after Surgery*

The results were evaluated in terms of mechanical alignment. Excellent mechanical alignment was defined as a value within the reported normal range of 5 degrees varus to 5 degrees of valgus. Good alignment was when the mechanical alignment was 5 to 10 degrees of varus. Poor was noted when the varus in the mechanical axis was

more than 10 degrees. Our results were evaluated only on the basis of the mechanical axis and complications as limb length discrepancy, subluxation were not taken into account.

### Analysis

The following statistical analysis was performed with the help of SPSS statistical package. The data gathered from the patients were used for this purpose. Simple descriptive analysis was performed to examine the incidence and nature of characteristics of Blount's disease. Inferential analysis was also performed to see the relationship among the various characteristics of Blount's disease.

## RESULTS

The results were graded as Excellent, Good and Poor depending upon the femoral-tibial mechanical axis measured on the roentgenograms done at the time of review. The result for the children lost from follow-up was taken from the hospital records and rated accordingly. The result of the above was done by using SPSS software. Fischer exact test was done variables with the outcome. For the purpose of statistical analysis, the results were grouped into two variables. The children with excellent and good were grouped together and children with poor result were selected as one variable.

The results of the present study are presented in the following sections.

Gender	Male	Female
Weight	8(38.1)	13(61.9)
	>95 <sup>th</sup> Percentile	<95 <sup>th</sup> Percentile
Gestation	16(76.2)	5(23.8)
	Full term	Prematurity
Family History	21(100)	0(0)
	Present	Absent
	<b>7(33.3)</b>	<b>66.6</b>

**Table 1. Personal Information**

Females are more commonly involved. Family history is not significant.

The incidence of Blount's in children with family history had good results in three cases and four children with poor results. In others there were nine children with good results and five with poor results (P value=.40) The children who weighed above 95th percentile had nine good results and seven poor results in comparison to three good results and two poor results in those below 95th percentile (P Value=1.0).

Classification	Frequency	Percentage
Infantile (0- 7 years)	15	71.4
Adolescent (8-12 years)	6	28.6
Affected limb		
Unilateral -left	11	52.4
Unilateral -Right	3	14.3
Bilateral	7	33.3

**Table 2. Physical Characteristics**

Infantile variety is more common and unilateral left tibia is more commonly involved.

	Right Tibial Torsion	Left Tibial Torsion
External tibial torsion	6(28.6)	3(14.3)
0 -10 degree internal tibial torsion	7(33.3)	4 (19.0)
11 - 20 degree internal tibial torsion	5 (23.8)	6 (28.6)
21- 40 degree internal tibial torsion	1 (4.8)	6(28.6)
Lost follow up cases	2(9.5)	2 (9.5)

**Table 3. Clinical Examination- Tibial Torsion**

### Note:

The values presented in the parentheses indicates the percentage.

The internal tibial torsion ranged from 10° to 40° preoperatively. Even in the eighteen cases that were operated upon, the internal tibial torsion remained the same, showing that the results of the operative procedures were not addressing the tibial or talar torsion adequately.

Langenskiold-Grade	Right	Left
Grade- I	1 (4.8)	
Grade - II	5 (23.8)	3 (14.3)
Grade -III		3 (14.3)
Grade -IV	2 (9.5)	5 (23.8)
Grade - V		2 (9.5)
Grade VI		2 (9.5)
Normal Knee	9 (42.9)	3 (14.3)
X ray 'Not available	4 (19)	3 (14.3)
<b>Tibio-Femoral Angle</b>		
0-5 degree valgus	2 (9.5)	1 (4.8)
0-10 degree varus	7 (33.3)	3 (14.3)
11-20 degree varus	3 (14.3)	
21-40 degree varus	6 (28.6)	14 (66.7)
X rays not available	3 (14.3)	3 (14.3)
<b>Meta-Diaphyseal Angle</b>		
0 -10 degree	9 (42.9)	2 (9.5)
11- 20 degree	5 (23.8)	9 (42.9)
21- 30 degree	3 (14.3)	2 (9.5)
31- 40 degree	1 (4.8)	5 (23/8)
X -rays not available	3 (14.3)	3 (14.3)
<b>Angle of Medial Slope</b>		
0-10 degree	13 (61.9)	5 (23.8)
11 -20 degree	2 (9.5)	4 (19)
21 -30 degree		2 (9.5)
31- 40 degree	3 (14.3)	7 (33.3)
X rays not available	3 (14.3)	3 (14.3)

**Table 4. Preoperative Radiological Features**

### Note:

The values presented in the parentheses indicates the percentage.

Langenskiöld grade 2 is more common. Tibio femoral angle mostly ranged from 21 to 40 degrees of varus.

Metaphyseal diaphyseal angle ranged from 11 to 20 degrees.

Osteotomy	Frequency	Percent
Lateral close wedge Osteotomy	8	38.1
Dome Osteotomy	6	28.6
Reverse Dome Osteotomy	1	4.8
Matchstick Osteotomy	1	4.8
Cone Hinge osteotomy	1	4.8
Reverse wedge lateral tibial Epiphysiodesis	1	4.8
Surgery not done	3	14.3
Fixation Staples	6	28.6
Plate & Screws	3	14.3
Steinman pins & Kirschner wires	6	28.6
Plaster of Paris cast	2	9.5
Tension band wiring	1	4.8
Surgery not done	3	14.3

**Table 5. Types of Surgical Procedures and Techniques Used**

Lateral Closed Wedge Osteotomy and dome Osteotomy are most common Procedures used

Tibial Torsion	Right	Left
External tibial torsion	10(47.6)	3(14.3)
0 -10 deg. Int. tibial torsion	6(28.6)	5(23.8)
11-20 deg Int. tibial torsion	2(9.5)	5(23.8)
21-40 deg Int. tibial torsion	1(4.8)	4(19)
Lost follow up	2(9.5)	4(19)
<b>Tibio-Femoral Angle</b>		
0-5 degree valgus	7(33.3)	2(9.5)
0-10 degree varus	7(33.3)	8(38.1)
11-20 degree varus	4(19)	5(23.8)
21-40 degree varus	1(4.8)	3(14.3)
X rays not available	2(9.5)	3(14.3)
<b>Angle of Medial Slope</b>		
0-10 degree	15(71.4)	8(38.1)
11 -20 degree	3(14.3)	4(19)
21 -30 degree	1(4.8)	2(9.5)
31- 40 degree		4(19)
X rays not available	2(9.5)	3(14.3)

**Table 6. Postoperative Clinical and Radiological Observations**

*Note:*

The values presented in the parentheses indicates the percentage.

#### Outcome of Surgery

The number of female children who had good results were seven in comparison to males who had good results ( $P=1.0$  by Fischer exact test -2 tailed). There were nine children in the infantile group who had good results (60%) and six poor results (40%) and in the adolescent group there were three children with good results (50%), and three children with poor results (50%) ( $P$  value=1.0). Unilateral children had six good results and seven poor results. Whereas in

bilateral there were six with good results and two with poor results ( $P$  value=0.37).

Complications	Frequency	Percentage
limb length discrepancy	6	28.6
joint subluxation	3	14.3
painful joint	2	9.5
recurrence of deformity	3	14.3
foot drop	1	4.8
lost follow up	1	4.8
Nil complications	5	23.8

**Table 7. Complications**

Limb length discrepancy is most common discrepancy followed by joint subluxation.

#### DISCUSSION

Blount's disease is a localized disorder of growth secondary to abnormal compression of the medial aspect of the proximal tibial physis. The literature does not show any statistics on the actual incidence of Blount's disease. The metaphyseal diaphyseal angle did not show and correlations with the final outcome. We conclude that m-d angle is useful only in detecting Blount's disease in our study Valgus correction was not obtained and hence the disease progressed. Henderson RC,<sup>5</sup> and Green WB,<sup>6</sup> in their study showed that in two cases neutral mechanical alignment progressed into adolescent tibia vara. The angle of medial slope was increased in seven cases and did not get corrected by the osteotomies. The study by Stantiskin DF explained that the medial slope is a myth. A concomitant epiphysiodesis of the lateral aspect of the proximal tibial epiphysis<sup>7</sup> and the proximal fibular epiphysis should be done to reduce the incidence of recurrence of varus.

Only one case in our series had undergone lateral epiphysiodesis. In our study there was no correlation between recurrence of varus deformity and preoperative deformity angle and degree/method of surgical correction. Fixation with staples, wires, plates/screws was not a factor.

From our study we conclude that incomplete correction of the biomechanical axis would lead to further progress from stage-2 to stage-5 Langenskiöld. And we feel that inadequate correction at early osteotomy may reduce the chance of cure after a second osteotomy. For patients who have infantile Blount disease, early operative intervention, before the child is four or five years old have been recommended.<sup>8</sup>

Our study recurrence was noted only for those children who underwent surgery at early stage in infantile group. Rab G.T in 1988<sup>9</sup> published an article stating that in nine cases of Blount's disease a single plane oblique tibial osteotomy allows simultaneous correction of varus and internal rotation deformities.

Thompson et al,<sup>10</sup> in 1984 reported a 50 percent recurrence rate in late onset tibia vara. Our study agrees with that. We had a recurrence of seven cases. We had a very poor outcome with match stick osteotomy. Bone

grafting was applied only in one case. In those knees, with fragmentation of the epiphysis, distraction osteogenesis is more appropriate than osteotomies.

In our study the reverse dome osteotomy had the best outcome. Our study shows that the metaphyseal osteotomies may not be the ideal choice of treatment in children above seven years of age. More complex procedures like distraction osteogenesis would be required to correct both the deformity and the limb length.<sup>11</sup>

De Pablos et al,<sup>12</sup> from Spain used physeal distraction for good correction and to prevent limb length discrepancy. Though the earlier studies of Langenskiold and others have not shown any limb length discrepancy, but later most studies on using external distraction devices have attributed the benefits of not obtaining limb discrepancy after using external fixation.

### CONCLUSION

We conclude that the osteotomies do not address the primary varus deformity because of the medial tibial epiphyseal disturbance, hence we suggest growth modulation procedures and distraction osteogenesis. Our recommendation is that surgical correction should aim at producing a MDA score between -5 & +5 degrees and valgus alignment with tibiofemoral angle of 0 to 5 degrees. We conclude that single cut osteotomies would not correct both varus and tibial torsion deformities of the tibia. Most metaphyseal osteotomies after seven years would lead to limb discrepancy. The type of implant used in the fixation of the osteotomy does not have any effect on the outcomes of the disease. Correct timing of the procedure, studying each case individually, depending upon age, anticipated leg length discrepancy at skeletal maturity, calculated loss of length of the longer leg and growth potential of the shorter leg has to be considered. This retrospective study does not have much statistical significance, but we hope it does throw open a lot of hypothesis for future research studies.

### REFERENCES

- [1] Langenskiold A, Riska EB. Tibia vara (osteochondrosis deformans Tibiae): a survey of seventy-one cases. JBJS 1964;46-A:1405-1420.
- [2] Levine AM, Drennan JC. Physiological bowing and tibia vara. The metaphyseal-diaphyseal angle is the measurement of bowleg deformities. J Bone Joint Surg 1982;64(8):1158-1163.
- [3] Bell DF. Treatment of adolescent Blount's disease using the ilizarov technique. Operat Tech Orthop 1993;3(2):149-155.
- [4] Langenskiold A. Tibia vara. A critical review. Clin Orthop Relat Res 1989;246:195-207.
- [5] Henderson RC, Lechner CT, DeMasi RA, et al. Variability in radiographic measurement of bowleg deformity in children. J Pediatr Orthop 1990;10(4):491-494.
- [6] Greene WB. Instructional Course Lectures, the American Academy of Orthopaedic Surgeons. Infantile Tibia Vara. J Bone Joint Surg 1993;75(1):130-143.
- [7] Blount WP, Clarke GR. Control of bone growth by epiphyseal stapling; a preliminary report. J Bone Joint Surg Am 1949;31A(3):464-478.
- [8] Loder RT, Johnston CE. Infantile tibia vara. J Pediatr Orthop 1987;7:639-646.
- [9] Rab GT. Oblique tibial osteotomy for Blount's disease (tibia vara). J Pediatr Orthop 1988;8(6):715-720.
- [10] Thompson GH, Carter JR. Late-onset tibia vara (Blount's disease). Current concepts. Clin Orthop Relat Res 1970;255:24-35.
- [11] McAllister CM, Stepanian J. Dome tibial osteotomy. Tech Knee Surg 2005;4(1):47-54.
- [12] de Pablos J, Franzreb M. Treatment of adolescent tibia vara by asymmetrical physeal distraction. J Bone Joint Surg 1993;75-B(4):592-596.