Tibia vara (Blounts disease)

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Blounts disease is a non physiological form of progressive genu varum due to asymmetrical growth inhibition of the posteromedial portion of the proximal tibial growth plate.

Pathology:
There is a disordered endochondral ossification of the medial part of the proximal tibial physis.

Radiological characteristics:
1. Varus angulation of upper tibial metaphysis
2. Beaking and lucency of medial tibial metaphysis
3. Widened and irregular medial physis
4. Medially sloped and irregularly ossified medial tibial epiphysis

These can lead to a progressive deformity with gait deviations, limb-length discrepancy and premature arthritis of the knee.

Classification of Blount disease
1. Early onset: Infantile
   - Onset below 4 years of age
2. Late onset: Onset after 4 years of age
3. Juvenile type: Onset at the age of four to ten years
4. Adolescent type: Onset after the age of ten years

Etiology
1. Unknown
2. Mechanical: Common in obese children who start walking early
3. Developmental disorder
4. Multifactorial
   Various genetic, humoral, biomechanical and environmental factors that control physeal growth and influence the development of normal lower limb alignment may be involved.

Clinical features
Infantile type
- Age of onset is commonly below 2 years and is mistaken as physiological genu varum. It can be bilateral in 60% of cases.
  1. Acute varus deformity of upper tibia
  2. Procurvatum deformity of upper tibia
  3. Internal tibial torsion
  4. Lateral thrust on standing indicates progression
  5. Lower femoral varus
  6. Increased femoral anteversion may contribute

Radiological changes are seen only after 18 months. They are:
1. Sharp varus angulation of the metaphysis
2. Widening and irregularity of the medial aspect of the growth plate
3. Medial sloping and irregular ossification of the epiphysis
4. Beaking of the medial part of epiphysis

A normal X-ray in a toddler does not exclude Blounts disease. Radiographic markers help to differentiate physiologic bowing from early-onset Blount disease in children less than two years of age.

1. Metaphyseo diaphyseal angle
   Levine and Drennan found that metaphyseo-diaphyseal angles of 11° or more developed Blount disease, whereas children with angles of less than 11° had physiological bowing that resolved with growth. This measurement is not an absolute prognosticator of Blount disease, but a value of more than 11° warrants close observation.

2. Epiphyseo metaphyseal angle
   An angle greater than 20° with a metaphyseo diaphyseal angle more than 11° in a
toddler with genu varum should raise suspicion of possible Blounts disease.

**Arthrogram**

Intraoperative arthrogram is helpful for delineating the articular surface and for evaluating dynamic instability of the knee. Hypertrophied medial meniscus and a posteromedial depression of the articular surface of the tibia are seen on arthrography.

**MRI**

Defines intra-articular changes such as posteromedial depression of the tibial plateau and hypertrophy of the medial meniscus in children with early onset disease. MRI can detect growth plate irregularities and early physeal bar formation. Changes in the adjacent distal femoral epiphysis and physis have been observed in many cases.

**Computerised Tomography:**

CT scans, particularly with three-dimensional reconstructions can also be useful for preoperative planning.

**Management**

Factors to be considered are age, sites affected (unilateral or bilateral), magnitude of deformity, Langenskiold staging and limb length discrepancy.

Problems to be managed are deformity – varus, procurvatum and internal torsion, joint depression, physeal bar, limb length discrepancy and chance of recurrence. The options for treatment are careful observation and follow up, orthotic treatment and surgical correction.

Orthotic treatment attempts to unload the medial compartment of the knee in children younger than 3 years and in Langenskiold stage I or II.

**Surgical procedures:**

a. Realignment osteotomy
b. Inter epiphyseal osteotomy
c. Intraepiphyseal osteotomy
d. Lateral hemiepiphyseodesis
e. Guided growth
f. Asym.proximal tibial physeal distraction
g. Resection of a physeal bar
h. Correction of limb length discrepancy

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Figure 1. A. Measurement of Tibiofemoral angle by by drawing lines along longitudinal axes of tibia and femur. B. measurement of Metaphyseo diaphyseal angle

Figure 2. Measurement of epiphyseo metaphyseal angle

Figure 3. Diagramatic representation of of radiographic changes seen in infantile type of tibia vara and their development with age
a. **Realignment osteotomy**

Proximal Tibial Metaphyseal Osteotomy

Variety of techniques has been advocated, including closing wedge, opening wedge, dome and oblique osteotomies. Various fixation techniques were described ranging from smooth pins, plates and screws to and external fixators. Choice of the osteotomy and fixation method are based on many factors, like patient’s age and body weight, the magnitude of the deformity, the presence of associated sagittal and axial plane deformities and the preference of the surgeon. Proximal tibial osteotomies with acute correction are associated with potential for neurologic injury and compartment syndrome. Prophylactic anterior compartment fasciotomy be considered for patients with Blount disease who are undergoing acute deformity correction.

Proximal tibial osteotomy described by Rab which uses a single-plane oblique cut allows simultaneous correction of varus and internal rotation and permits postoperative cast wedging if necessary to obtain appropriate position is the popular osteotomy.

Prognostic factors following osteotomy:
1. Age at osteotomy: Lesser recurrence rate in younger patients
2. Langenskiold stage: Recurrence rate increases with stage
3. Valgus overcorrection: 5-10° of valgus overcorrection decreases the chance of recurrence.

b. **Guided growth**

Guided growth with a non-locking titanium plate with screws placed extraperiosteally across the convex growth plate was popularised by Stevens. This plate with two screws, one in the metaphysis and the other in the epiphysis, serves to reduce growth on the convex side. Once the mechanical axis of the limb has been restored or slightly overcorrected, the implant can be removed with the anticipation of resumption of the previous growth rate at the involved physis. The role of guided growth in early onset Blount's disease is unclear but it has a role in late onset cases with mild deformity (< 15°) with at least two years of growth left.

c. **External fixation with gradual correction**

Gradual correction with distraction ostegenesis appears to be a safe and reliable means of treating children with multiplanar deformities and limb-length discrepancy. Introduction of the Taylor Spatial frame has given an opportunity to correct multiplanar deformities as seen in Blount's disease with greater accuracy. Studies have shown that gradual correction was a more accurate method of correcting multiplanar deformities in patients with Blount disease.

d. **Asymmetrical physeal distraction**

Asymmetrical distraction corrects the deformity but causes fusion of physis. This technique described by De ablos and Franzreb has not gained popularity.

e. **Physeal bar resection**

Physeal bar excision and interposition of fat has been tried along with osteotomy in the advanced stages of the disease. Long term results are not well documented.

f. **Elevation of the medial plateau**

Elevation of the medial plateau by intra epiphyseal or trans epiphyseal osteotomy has been attempted in late stages of disease. The metaphyseal osteotomy, with or without

<table>
<thead>
<tr>
<th>Langenskiold stage</th>
<th>Age (Years)</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>&lt; 4</td>
<td>Bracing</td>
</tr>
<tr>
<td>1, 2</td>
<td>&gt; 4</td>
<td>Proximal metaphyseal osteotomy</td>
</tr>
<tr>
<td>3</td>
<td>&gt; 4</td>
<td>Proximal metaphyseal osteotomy with or without derotation</td>
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<tr>
<td>4, 5</td>
<td>&lt; 10</td>
<td>Intra epiphyseal osteotomy with proximal metaphyseal osteotomy</td>
</tr>
<tr>
<td>4, 6</td>
<td>&gt; 10</td>
<td>Inter epiphyseal osteotomy with proximal metaphyseal osteotomy</td>
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<tr>
<td>Multiple recurrences</td>
<td></td>
<td>Upper tibial &amp; fibular epiphyseodesis + Proximal metaphyseal osteotomy + limb lengthening</td>
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</tbody>
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Table 1. Outline of treatment of Blount's disease
lengthening, can be performed at the time of the plateau elevation.

Adolescent Blounts disease
Late onset disease occur after 4 years of age. Thompson and Carter classified them as
ii. Juvenile type (onset at the age of four to ten years)

iii. Adolescent type (onset after the age of ten years)

Adolescent type is characterised by:
1. Age of onset after 10 years
2. Mild physeal changes
3. No physeal bar or metaphyseal changes
4. Very little chance of recurrence

Treatment options:
a. Realignment osteotomy
b. Proximal tibial osteomy and gradual correction by external fixator
c. Lateral hemi epiphysodesis

Figure 3. Hemicondylar tibial osteotomy for correction of the deformity

REFERENCES
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