# OUTCOME OF OPENING-CLOSING WEDGE OSTEOTOMY IN THE CORRECTION OF BLOUNT'S DISEASE

**H.O. Obiegbu,** MBBS, FWACS, VFMC Ortho, FAO Spine, Department of Orthopaedic Surgery, Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra state, Nigeria. Email: obinnaobiegbu@yahoo.com

## ABSTRACT

**Background:** Blount's disease, a multiplanar deformity characterized by tibia vara, is usually a cause of concern for the caregivers. Although early onset Blount's disease is treated with observation and trial of brace, surgical correction is usually needed for late or persisting deformities.
**Objective:** The aim of this study was to describe the technique and evaluate the outcome of opening-closing wedge osteotomy in the correction of Blount's disease.
**Design:** This was a retrospective study.
**Methods:** Data was collected over a five year period (including age, follow up duration, pre and post-operative tibio femoral angles). Seventeen patients (with 25 extremities) were analyzed. SPSS version 22 was utilized.
**Results:** The majority of patients (41.2%) were aged between 5-10 years. The mean pre-tibio-femoral angle was 34.75 ± 16.51, while the post operativetibio-femoral angle was 7.83 ± 9.81. No implants were used.
**Conclusion:** Opening-closing wedge osteotomy is a safe and effective technique in the management of Blount's disease

**Key words:** Tibia vara, Wedge, Osteotomy, Langeskiold, Chevron

## INTRODUCTION

Blount disease, a multi-planar deformity of the lower limbs is characterized by abnormalities in endochondral ossification of the medial epiphyseal plate of the proximal tibia. Although the eponymous condition described by Blount in 1937 (1) implied only a frontal plane deformity; other authors have since noted a multi-planar abnormality consisting of tibia vara, internal rotation and procurvatum (2,3). The natural history of Blount's disease is characterized by a progressive irreversible pathological changes mainly at the medial proximal tibial epiphysis as a result of growth disturbances of the physis (4).

Blount's disease can occur in a child of any age, and is classified into two groups: early onset and late onset types. The early onset which is also termed infantile type includes disease occurring in children less than 3 years old, while the late onset type includes disease occurring in patients aged 4-10 years old (also termed juvenile disease) and patients aged 11 years and above (also termed adolescent type) (5). Although Blount's disease has remarkable clinical features on examination including tibia vara and an internal tibial torsion, a plain radiography is the main tool for diagnosis (6). Radiological diagnosis was introduced by Langeskiold (7). Langeskiold classified tibia vara into six progressive stages relative to the degree of tibial metaphyseal-epiphyseal and metapyseal-diaphyseal changes as observed on a radiograph.

The management of Blount's disease is tailored based on a number of factors including severity of deformity (Langeskiold staging), age and limb length discrepancy. Generally, patients with early onset Blount disease are treated with observation or trial with a brace including the using of a knee ankle foot orthosis. However, in patients with persisting deformities or an increase in deformity while on orthotic device and late onset Blount disease, surgical correction is advised (8). Surgical correction has traditionally included gradual and an acute correction. Gradual correction involves distraction osteogenesis. Although this technique is believed to be safe, often providing satisfactory results in multi-planar deformities, various difficulties have been encountered (8). This includes poor patient compliance leading to premature consolidation at the corticotomy site, correction failure and pin site infection. Acute correction of deformities in Blount disease includes wedge osteotomies (opening, closing), dome, inclined and serrated osteotomies.

Greene (9) described a chevron osteotomy in which opening and closing wedges can be made so that the limb length discrepancy present in moderate to severe Blount's disease is not

increased. However, there is paucity of studies showing outcome of Blount's disease following correction with a chevron osteotomy. In this study, evaluation of the outcome of an opening-closing wedge osteotomy in the treatment of Blount disease was done.

## MATERIALS AND METHODS

This was a retrospective study with data collected over a five year period (from January, 2015 to January, 2019). Seventeen patients (twenty five extremities) who had a proximal tibial chevron osteotomy for Blount disease were analyzed.

Biodata of all patients, pre-operative and post operative tibiofemoral angles, complications and time to union was obtained. Statistical analysis was done with SPSS version 22. A p value of 0.5 was considered statistically significant.

*Surgical technique:* Pre-operative tibio-femoral angles were measured in all patients prior to surgery, and clinical pictures of the deformity obtained (Figure 1). With the patient under anaesthesia, and tourniquet inflated, the fibula was approached through a lateral incision, and a mid fibulectomy of 1-2 cm was done. An anteromedial longitudinal incision was made over the proximal tibia, with the periosteum overlying the tibia elevated, and retracted using Hohman's retractors. The proposed site for the chevron osteotomy (with the apex directly beneath the tibial tuberosity) is marked out using a power tool to make multiple bone drills (Figure 2).

The osteotomy was done using a small osteotome to connect the pre-dilled sites (Figure 3). A lateral wedge of bone was removed (Figure 3), derotation and $5^0$ valgus overcorrection done if the tibiofemoral angle was less than $30^0$. In tibiofemoral angles that were greater than $30^0$, derotation and varus correction of $30^0$ was done; and full correction (manipulation under anaesthesia) done a week apart. This was done to prevent overstretching the neuro-vasculature. The removed lateral wedge of bone was subsequently re-inserted into the medial open wedge (Figure 5), and length of the limb was maintained.

The periosteum over the osteotomy site was approximated, and skin closure at both the fibulectomy and osteotomy sites closed with non-reabsorbable sutures (Figure 6). A back slab was thereafter applied. Post-operative management included analgesics, and close monitoring for neurovascular compromise. The backslab was thereafter completed to a full cast a week after, and non-weight bearing mobilization commenced. The patient was thereafter started on partial weight bearing when sufficient callus was noted on X-rays, and full weight bearing when union at the osteotomy site was seen. A minimum of an eight month follow up was done, and the Tibio-Femoral Angle (TFA) was reassessed on each follow up visit.

## RESULTS

Table 1 shows that the most commonly affected age group in this study were the 5-10 year age group.

**Table 1**
*Age distribution of the patients*

| Age (years) | Frequency | (%) |
|---|---|---|
| 1-4 | 3 | 17.6 |
| 5-10 | 7 | 41.2 |
| 11-15 | 5 | 29.4 |
| 16-20 | 2 | 11.8 |
| Total | 17 | 100 |

Table 2 shows the distribution of the tibio-femoral angles in the recruited subjects. The mean pre-operative tibio-femoral angle was 34.75 ± 16.51.

Table 3 shows the postoperative tibio-femoral angles. The mean post-operative tibio-femoral angle was 7.83 ± 9.81. There was a statistically significant difference between the pre-operative and post-operative tibio-femoral angles.

**Table 2**
*Pre-operative TFA in patients*

| TFA | No. | (%) |
|---|---|---|
| 10-20 | 6 | 25.0 |
| 21-30 | 6 | 25.0 |
| 31-40 | 3 | 2.50 |
| 41-50 | 6 | 25.0 |
| >50 | 3 | 12.5 |

**Table 3**
*Post-operative tibio-femoral angle*

| TFA | No. | (%) |
|---|---|---|
| 0-10 | 17 | 72 |
| 11-20 | 4 | 16 |
| 21-30 | 3 | 12 |

**Table 4**
*Follow up variables*

| Mean | Range | |
|---|---|---|
| Follow up visit | 3.88 | 2-6 |
| Time to full weight bearing (days) | 72.62 | 52-105 |

## DISCUSSION

Although several techniques have been advocated for the surgical management of Blount's disease including opening wedge osteotomies, closing wedge osteotomies, fibular osteotomy, hemi-epiphyseal stapling and different types of external fixators; each is not without its drawbacks.

In a study by Sachs *et al* (10), complications such as pin site infection and delayed union were noted after gradual corrections using a Taylor spatial frame was employed for the treatment of Blount's disease. Several other complications have been noted in patients who had an opening wedge osteotomy to Blount's disease, including compartment syndrome, neurovascular injury, and an inability to maintain correction (11). Other complications that may also result with the use of an opening wedge osteotomy include wound problems such as dehiscence, cellulitis and deep infections (12). Closing wedge osteotomy often worsens the pre-existing limb shortening that is present in Blount's disease and may also lead to the metaphyseal stock being compromised (13).

In this index study, an opening-closing wedge osteotomy was done for patients with Blount's disease (tibia vara) and the deformity was acutely corrected if the tibio-femoral angle was less than $30^0$. Acute correction has been implicated with a higher risk of compartment syndrome and neurovascular compromise especially in patients with more severe deformities (14). However, in this index study, no compartment syndrome or neurovascular compromise was reported. Other advantages of the opening-closing wedge osteotomy is the ability to use this technique in severe deformities. The mean pre-operative tibio-femoral angle in this study was 34.75 ± 16.51 with a range of $11^0$ to $70^0$, compared to a mean of 26.64 and a range of 15.0 to found 36 in the study

by Griswold *et al* (12) where an opening wedge osteotomy was used for correction of adolescent Blount's disease. The use of techniques such as a proximal opening wedge osteotomy may be difficult in these severe deformities, as the size of the wedge required would be impractical (12).

In conclusion, opening-closing wedge osteotomy is a safe and effective technique in the management of Blount's disease (Tibia vara), and can be used even in severe deformities, where the use of other corrective techniques may be impossible.

**Figure 1**

*Pre-operative clinical photograph*

**Figure 2**

*Pre-drilling of the proposed osteotomy site*

**Figure 3**

*Wedge osteotomy of the lateral tibia cortex*

**Figure 4**

*Insertion of lateral wedge of bone medially*

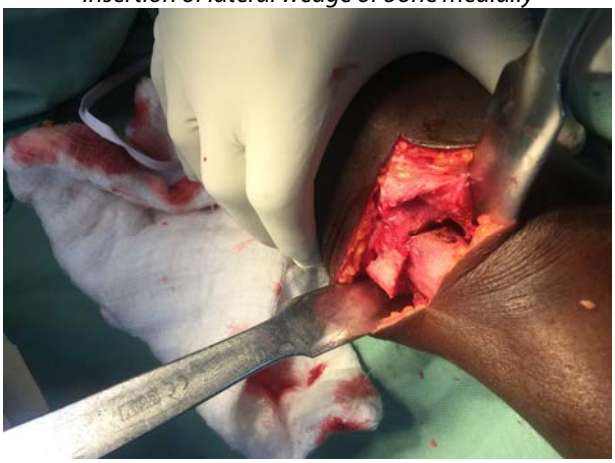

**Figure 5**

*Post-op correction of deformity*

## REFERENCES


1. Blout, W.P. Tibia Vara. Osteochondrosis deformans tibiae. *J Bone Joint Surg Am*. 1937; **19-A**: 1-29.
2. Golding, J.S.R.and Mc Neil-Smith, J.D. Observation on the etiology of tibia vara. *J Bone Joint Surg* [Br] 1963; **45**: 320-325.
3. Sabharwal, S., Lee, J., Zhao C. Multiplanar deformity analysis of untreated Blout's disease. *J Pediatr Orthop*. 2007; **27**: 260-265.
4. Khanfour, A. Does Langeskoild staging have a good prognostic value in late onset tibia vara? *J Orthop Surg Res*. 2012; **7**(3): 749- 752.
5. Hossam, K. Valgus rotational dome shaped tibial osteotomy in treatment of tibia vara. *Egypt J Hosp*. 2001; **4**: 52-58.
6. Stricker, S.J., Edwards, P.M. and Tidwell, M.A. Langenskiold classification of tibia vara: An assessment of interobserver variability. *J Pediatr Orthop*. 1994; **14**; 152-155.
7. Langenskiold, A. Tibia vara (osteochondrosis deformans tibiae); a survey of 23 cases. *Acta Chir Scand*. 1952; **103**:1-22.
8. Hefny, H. and Shalaby, H. A safer technique for double elevation osteotomy in severe infantile tibia vara. *Strategies Trauma Limb Reconstr*. 2010: **5**(2); 79-85.
9. Greene, W.B. Infantile tibia vara. *J Bone Joint Surg*. 1993; **75**(1):130-143.
10. Sachs, O., Katzman, A., Abu-Johar, E. and Eidelman, M. Treatment of adolescent Blount disease using Taylor spatial frame with and without fibular osteotomy: is there any difference? *J Pediatr Orthop*. 2015; **35**:501-506.
11. Sabharwal, S. Blount disease. *J Bone Jt. Surg*. 2009; **91**(7):1758-76.
12. Griswold, B., Gilbert, S. and Khonyr J. The correction of ad J. Opening wedge osteotomy of adolescent tibia vara. *Iowa Orthop J*. 2018; **38**:141-146.
13. Siregar, P.U. Bamboo osteotomy for Blount's disease. *Malays Orthop J*. 2010; **4**(1): 56-59.
14. Gilbody, J., Thomas, G. and Ho, K. Acute versus gradual correction of idiopathic tibia vara in children: a systematic review. *J Pediatr Orthop*. 2009; **29** (2): 110-114.