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Early Recurrence of Blount's Disease Following Acute Correction

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ABSTRACT

Background: Blount's disease, an asymmetrical disorder of the proximal tibia usually affects different age groups. Acute correction of the deformity via a tibia osteotomy with or without implants is a preferred modality of treatment. However, recurrence of deformity is a common complication. **Objectives:** This study was done to determine early recurrence of deformity post-surgical correction of this disease. **Materials and Methods**: This was a retrospective study done over a five years period at the Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria. Seventeen patients with twenty four extremities were recruited into this study. Inclusion criteria were patients who presented with Blount's disease, and had corrective osteotomy at our institution and followed up for one year. Patients who had a prior history of surgery were excluded from the study. Statistical analysis was done with SPSS version 22. A p value of <0.05 was considered statistically significant. **Results:** Recurrence noted in this study was 29.2% (seven out of twenty four extremities), with patients aged four years or less having no recurrence. The mean pre-operative tibio-femoral angle was 34.750 ± 16.510; and there was a statistically significant correlation between pre-operative tibio-femoral angle and recurrence ($p \leq 0.05$). **Conclusion:** The cause of recurrence is multi-factorial and may include age at presentation and pre-operative tibio-femoral angle.

Keywords: Recurrence, Tibio-femoral angle, Osteotomy

INTRODUCTION

Blount's disease, also known as tibia vara refers to an asymmetrical disorder of the proximal tibia characterized by a varus angulation and an internal rotation of the tibia. It manifests within different age groups and is typed into: Infantile tibia vara-which manifests in patients aged within 1-3 years; and Late onset tibia vara-which is sub classified into Juvenile tibia vara-when it occurs within 4-10 years and Adolescent tibia vara when it occurs after 10 years.[1] Modalities of treatment of Blount's disease have typically included operative and non-operative methods (bracing); although the effectiveness of bracing continues to be controversial.[2] While early onset (infantile) Blount may be managed with bracing, patients presenting with late onset disease, persisting deformities or an increase in deformity while on an orthotic device are managed surgically.[3] Surgical treatment includes acute and gradual correction; with each having its own draw backs.

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Gradual correction usually entails corticotomy and distraction osteogenesis, and complications have included pre-mature consolidation at the corticotomy site, pin site infection, under and over correction.[3] This technique of gradual correction also requires a high level of patient compliance[3]. Acute correction involves some form of osteotomy, with an acute correction to the normal mechanical axis of the tibia with or without the addition of implants. Complications include nerve palsies, malalignment, compartment syndrome and failure of fixation.[4]
Recurrence remains a major issue for the operating surgeon and the patient/ caregiver; and it is said to occur when the tibio-femoral angle (TFA) is more than 10^0 varus at follow up.[5] There is as yet no definite conclusion regarding which factors cause recurrence, and it may in fact be multifactorial. Factors that have been implicated in recurrence include age, obesity and radiographic staging.[6-7]
The aim of this study was to determine the recurrence of Blount's disease after a one year follow up.

MATERIALS AND METHODS

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

Study Area: This study was conducted at the Nnamdi Azikiwe university teaching hospital,Nnewi, Anambra state; Nigeria; located at the South Eastern part of Nigeria.

Inclusion criteria: Patients who presented with untreated Blounts' disease and subsequently had a corrective osteotomy done by the same orthopaedic unit (headed by the authors) with a minimum follow up of one year were recruited into this study.

Exclusion criteria: Patients who had prior surgical intervention; and also patients whose medical records could not be retrieved.

Outcome measure: The Tibio-femoral angle was measured at each clinical visit post-operatively within the follow up period. A tibio-femoral angle of $>10^0$ was regarded as recurrence.

Recruitment of participants: Biodata of all patients, pre-operative and post operative tibiofemoral angles (at one year), complications and time to union was obtained from the medical records of the hospital. Statistical analysis was done with SPSS version 22. A p value of 0.5 was considered statistically significant. Ethical approval was obtained from the hospital ethical committee.

Procedure
Pre-operative tibio-femoral angles were measured in all patients prior to surgery, and clinical pictures of the deformity obtained (Fig A). 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 and a chevron was done (Fig B), with the varus deformity subsequently corrected.The periosteum over the osteotomy site was approximated, and skin closure at both the fibulectomy and osteotomy sites closed with non-absorbable sutures (F. 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 begun 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 eighteen month follow up was done, and the tibio-femoral angle (TFA) was reassessed on each follow up visit.

Statistical Analysis: The data was analyzed using the Statistical Package for Social Sciences (SPSS) for Windows (Version 22.0). Chi-Square test and T-test analysis were done. The level of significance was $p<0.05$.

RESULTS

A total of 17 patients with twenty four extremities were recruited into this study. Table 1 shows the age distribution of the patients with the 5 to 10-year age group being the most common.

Table 1: Age distribution of the patients

Age (Years)	Frequency	Percent
1-5	3	17.6
6-10	7	41.2
11-15	5	29.4
16-20	2	11.8
Total	**17**	**100.0**

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 2: Pre-operative Tibio-femoral angle (TFA) in patients

TFA (^{0})	Number	Percent (%)
10-20	6	25.0
21-30	6	25.0
31-40	3	12.5
41-50	6	25.0
>50	3	12.5

Recurrence was defined as a tibio-femoral angle of >10. From table 3, seven patients (29.2%) had recurrence of Blount's disease after corrective osteotomy.

Table 3: Post-operative Tibio-femoral angle

TFA	Number	Percent (%)
0-10	17	72.0
11-20	4	16.0
21-30	3	12.0

Recurrence was higher in patients with a higher pre-operative TFA; and this was statistically significant.

Table 4: Correlation between recurrence and preoperative TFA

Recurr ence	N	Mean (± SD)
Yes	7	54.71 ± 13.1
No	17	26.53 ± 9.0

P< 0.05

Table 5 shows that there is no correlation between age and recurrence of Blount's disease. However, there was no recurrence noted in all the patients aged 4 years or less at the time of surgical correction.

Table 5: Correlation between Age at presentation and Recurrence

	Recurrence	n	%
Age	≤4	0	0.0
	>4	7	28.0

P< 0.05

Fig A: Showing preoperative clinical photograph

Fig B: Showing intra-operative Chevron osteotomy

DISCUSSION

Recurrence in Blount's disease post corrective osteotomy remains a major concern for both the managing physician and the patient, with several studies showing a varying recurrence rate post corrective osteotomy.

High recurrence rates (30-100%) have been reported after treatment of Blount's disease with corrective osteotomy.[8-9] In this index study, the recurrence rate of Blount's disease was 29.2%. The cause of recurrence in Blount's disease may be multifactorial, and they include age at correction, Langeskiold staging/ Pre-operative tibio-femoral angle.[10] In a study done by Ferriter *et al*,[11] there was a recurrence rate of 76% in patients who had their initial surgery at an age older than 4.5 years, compared to a recurrence rate of 31% in patients who had their initial surgery before 4.5 years. Similarly, in a study done by LaMont et al,[12] the mean age of patients who developed recurrence (6.2 years) was significantly different from those without recurrence (4.3 years). These agree with our index study, where no recurrence was in patients aged 4 years or less. However, a smaller sample size in the 4 years or less age group may have accounted for this.

In contrast to these findings, a study done by Jardaly et al[13] observed no statistically significant difference in the recurrence rates in patients younger than 4 years when compared to that in their counterparts older than 4 years.

In this index study, there was a correlation between the pre-operative tibio-femoral angle and recurrence; with patients with a higher pre-operative TFA having a statistically significant increase in recurrence than their counterpart with a lower score. These findings were also similar with to that in the study done by Jardaly et al[13] who studied the recurrence of Blount's disease using anew classification system (that had patients with a higher TFA in a more severe group); they noted that recurrence were higher in more severe deformities.

CONCLUSION

In conclusion, although corrective osteotomy remains a primary modality of treatment for Blount's disease, recurrence remains a major complication and may be caused by factors such as age at correction and the severity of the pre-operative tibio-femoral angle.

Data availability: The data used to support the findings of this study are available from these sites publicly.

Declaration of conflicts of interest: The authors declare that there are no potential conflicts of interest with respect to research, authorship and/or publication of this article.

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Ethical approval: The study was approved by the Institutional Ethics Committee.

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