CASE REPORT
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Simultaneous Gradual Correction of Bilateral Late Onset Tibia Vara using High Tibial Osteotomy with a Mono-Axis Dynamic External Fixator: A Case Report

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ABSTRACT

Tibia vara is a disease characterized by an abrupt angulation of the tibia into varus at the proximal end. This condition is caused by developmental growth defect of the proximal tibia physis. Tibia Vara can be classified into groups according to the age of the patient and the mainstay treatment is either acute or gradual surgical correction.

A 21 year-old man with chief complaint bowing of the legs with leg pain since 3 years before going to a doctor. Physical examination showed bilateral genu varum. The anteroposterior long leg standing X-Ray found that the deformity was of osseous origin at the proximal part of the tibia in varus position. Medial osteotomy of the proximal tibia was performed and a dynamic external fixator was installed. Gradual correction was performed at a rate of 1 mm per day. After 3 months, radiological evaluation showed good union and target angle of correction with acceptable mechanical axis was achieved. Patient had no complaint of pain or instability post-surgery.

Gradual correction using external fixator provides a more flexible angle correction with lower risk of neurovascular compromises; but with its own disadvantage such as loss of correction after removal of the external device. In this case, gradual correction of late onset tibia vara using dynamic external fixator provides satisfactory outcome and enable a more fine-tuned angle correction. It also potentially eliminate the need for a second surgery to remove the external device; thus reducing the length of hospitalization.

Keywords: *Tibia Vara; Reconstruction. External Fixation. High Tibial Osteotomy*

Level of Evidence : IV

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Introduction

Tibia vara, also known as osteochondrosis deformans tibiae or Blount disease is a developmental defect in growth of proximal tibia physis. It was first described by Erlacher in 1922 and later in 1937, Blount defined it further and classified the disease into groups according to the age of the patient: infantile and adolescent form.

Recently clinicians grouped them into early-onset if the deformity first noticed before 4 years old and late-onset if noticed after.[1]

Tibia vara are evaluated both clinically and radiologically on anteroposterior view using long standing X-ray (hip-to-toe). Measurements to identify the deformity include mechanical axis deviation (MAD), medial proximal tibial angle (MPTA).[2]

The morphology of the proximal tibiae in the disease-free Asian knee is inherently varus but still in the range of the world populations.

In 2021 Ho et al. reported a significant difference in MPTA between ethnic group within Asians with mean of 87.0° ± 2.2° (Mean ± Standard Deviation).[3] MAD described as distance of the mechanical axis to the center of the knee with mean of 10 mm medial (normal 3 – 17 mm medial)[4] Surgical treatment is the main treatment of tibia vara.

The surgical options are epiphysiolysis, hemiepiphysiodesis, and osteotomy. Correction using osteotomy can be acute correction using internal fixation or gradually using external fixators. Acute correction was the preferred surgical treatment in the past, but reports of complications such as peroneal nerve palsy, acute compartment syndrome and inability to correct limb length discrepancy made clinicians to look for other methods of surgical treatment.[5] Gradual correction in recent years had been reported to have satisfactory outcome in correcting deformity. However, it came with its own complication such as recurrent deformity in severe cases.[6]

Case Presentation

We present a 21-year-old male with a chief complaint of bowing on both of his legs. Physical examination showed bilateral genu varum, Body Mass Index of the patient is normal (BMI 19.57).

The patient also complained about recurrent moderate pain surrounding both of his calf after exercise. Deformity was first noticed at 16-year-old with no report of any problem before that. We ordered an anteroposterior long leg standing X – ray to measure MAD and MPTA (figure 1). The deformity was of osseous origin, in both of his proximal tibia in varus position.

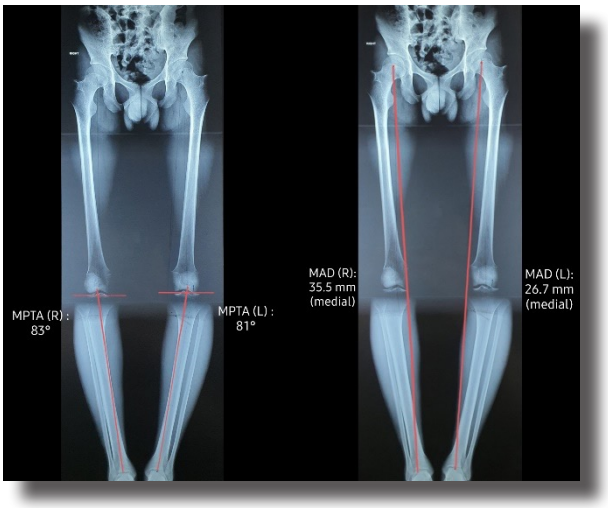

Figure 1. (left to right) : Medial Proximal Tibia Angle (R) 83° / (L) 81° Mechanical Axis Deviation (R) 35.5 mm medial / (L) 26.7 mm medial (L) to the midpoint of knee joint

The surgery was bilateral high medial tibial osteotomy followed by installation of dynamic external fixator. The goal was to gradually achieve neutral mechanical angle in both of his proximal tibia. The surgery was performed under spinal anesthesia in supine position. First step of the surgery was to insert the first two proximal pins parallel to the tibial plateau about 1 cm below the joint line.

Then, the lower arm of the clamp is used as a guide to drill the bone to make insertion of two distal pins in the tibial shaft. An incision was later done to expose the bone to perform an osteotomy about 5 cm below the joint line obliquely pointing to the proximal tibio-fibular joint, and preserving the lateral part of the tibia to act as a hinge. The surgery was performed on April 15th, 2019

followed by gradual correction by distracting the wedge with a rate of 1 mm per day.

Special attention was given to wound hygiene to prevent superficial pin tract infection. A post-operative imaging was performed to ensure the external fixator was placed properly, then the patient was later discharged after 3 days and was encouraged to perform early mobilization in accordance to the patient's tolerance.

Visit to our outpatient department were scheduled once every two weeks perform clinical evaluation. Radiological evaluation was performed every four weeks to evaluate the process of bone healing and by the 16th week the patient achieved good union and his radiological evaluation (figure 2) showed neutral angle.

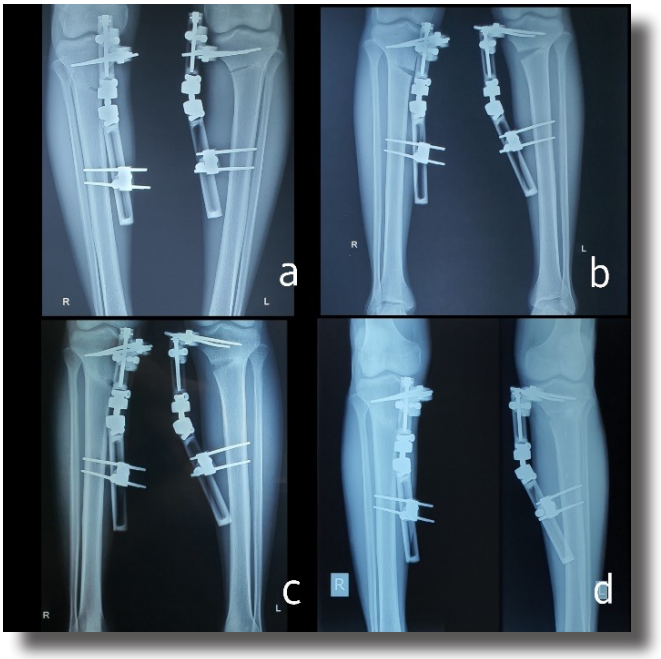

Figure 2. Gradual Correction X-Ray: a. 4 weeks, b.8 weeks, c.12 weeks, d. 16 weeks after surgery respectively.

The external fixator was later removed and the patient was sent home immediately after the removal. We performed another long leg standing radiograph 27 months (figure 3) after the surgery to evaluate the outcome Right MPTA 88.6° and Left MPTA 89.1°.

Right MAD was 4 mm lateral and Left MAD 11 mm lateral to the midpoint of knee joint, the patient has no complaint of pain or instability post-surgery.

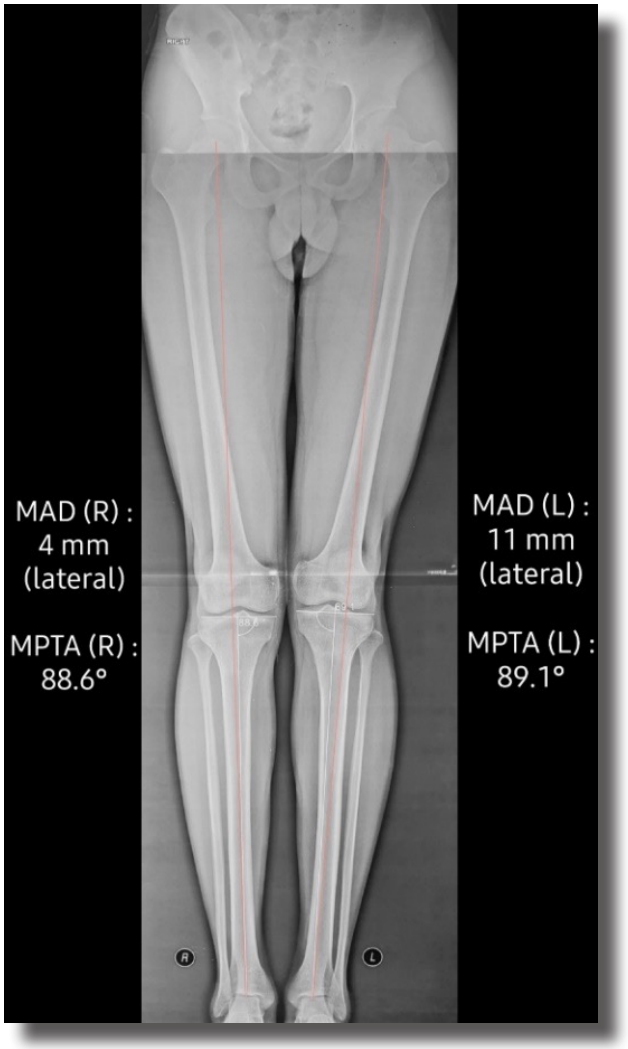

Figure 3. 27 month after surgery Medial Proximal Tibia Angle (R) : 88.6° / (L): 89,1°, Mechanical Axis Deviation (R) 4 mm lateral /(L) 11 mm lateral to the center of knee joint

Discussion

In developing countries, patients with lower limb deformity often presented late because most of the time the case is relatively asymptomatic. Some would go for alternative treatment or just accept the condition.

The mainstay treatment is surgical correction, either gradual or acute. Gradual correction using external fixator provides less risk of neurovascular compromise and a more flexible angle correction, additionally it can also help correcting limb length discrepancy. Disadvantages of this method includes potential loss of correction after external device removal especially in obese patient.[7] There was also reported case of fracture at the

site of correction in obese patient after removal of the external fixator, thus longer duration of frame application are advised in this group of patients.[1]

In our patient, the tibia vara is diagnosed late at 21 years old with relatively no complicating factors; so the surgical options were more flexible. In younger patients with active growth plate, other methods need to be considered such as hemiepiphyseodesis. Murphy et al. reported satisfactory outcome by hemiepiphyseodesis followed by installation of percutaneus transphyseal screw, and it potentially eliminate further surgery to correct deformity.[8]

Post-correction result was measured using MAD and MPTA. Target MPTA was achieved in both side, right MPTA corrected from 83° to 88.6°, and left MPTA from 81° to 89.1°. These results were within normal range of MPTA in Asian ethnic group which has a normal value 87.0° ± 2.2° (mean± standard deviation). The result of MAD after correction on the right tibia from 35.5 mm medial to 4 mm lateral, left side 26.7 mm medial to 11 mm lateral to the midpoint of knee joint. This made the MAD closer to the neutral angle, but in a slight valgus position. In 2019 Saw et al. reported only one case needed a revision surgery following a significant valgus overcorrection with MAD of 28.2 mm lateral to the center of knee joint.[1] There is still no consensus regarding the correction of late onset tibia vara, but over correction is not advised.[9]

Conclusion

Gradual correction of late onset tibia vara using dynamic external fixator shows satisfactory outcome and provides the surgeon with increased flexibility of angle correction. It also potentially eliminate the need for a second surgery to remove the external device thus reducing the length of hospital stay and it might be more convenient for the patient.

Special attention needs to be given to obese patients to perform this method, since there is a potential risk of fracture at correction site and loss of correction after the device removal. Other methods need to be considered especially in younger patients with active growth plate, such as hemiepiphyseodesis and guided growth.

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