Bamboo Osteotomy for Blount's Disease

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ABSTRACT

Blount disease is a common childhood condition that requires surgical correction. The conventional method of osteotomy and acute correction is associated with risk of neurovascular complications and occasionally displacement of the intra operative alignment. This case report describes a new technique that involves multiple longitudinal osteotomies over the proximal tibia without loss of cortical continuity between the proximal and distal tibia. It simulates an incomplete (greenstick) fracture that allows plastic deformation at the site of correction. This correction is more stable, and can be expected to heal more rapidly than conventional treatments.

Blount disease is a developmental condition characterized by disordered endochondral ossification of the medial area of the proximal tibial physis resulting in multiplanar deformities of the lower limb [1]. Secondary to asymmetrical growth with relative inhibition of the posteromedial portion of the proximal tibial growth plate, a three-dimensional deformity of the tibia with varus, procurvatum (apex anterior), and internal rotation develops, along with possible limb shortening in unilateral cases [2].

The management of Blount disease must be customized for each patient on the basis of the patient's age, severity of deformity and the level of treatment facilities available. Acute correction of angular and rotational deformity can be accomplished with a proximal tibial osteotomy. However, neurovascular complications and displacement of bony alignment achieved during surgery are possible problems with such treatment [3]. We have developed an innovative osteotomy technique to minimize these problems and describe such a case here.

CASE REPORT

A 9 year old girl presented with severe varus deformities of left leg. She was able to ambulate but did so with a limp and suffered pain in left knee. Physical examination showed thigh leg angles of 750on the left knee. Range of motion of both knees was 0 – 1350. The hips showed full range of motion. Radiographs demonstrated femoral-tibial angles of 430 on the left (Figure 1) with mild involvement on the right side as well. Her condition was consistent with Langenskiold type V infantile tibia vara.

Osteotomy was planned starting with the left side. We chose a site for osteotomy at the proximal tibia that allowed placement of 2 proximal segment screw fixations with a locking compression plate (LCP) with no interruption of the epiphyseal growth plate (Figure 2A). A 4 cm longitudinal skin incision was made at the proximal tibia, starting about 0.5 cm lateral to the tibial crest and 1.5 cm below the tibial tuberosity. The incision was deepened layer by layer down to the periosteum. The periosteum was incised longitudinally about 4 cm long and then bluntly stripped circumferentially from its attachment to the bone. Using an oscillating saw, several longitudinal cuts were made (each approximately 4 mm wide) beneath the stripped periosteum (Figure 2B). After that the periosteum was sutured with absorbable suture to enable the periosteum to fully encase the osteotomised bone. Using a different approach, a short segment of the ipsilateral fibula was resected. Subsequently, forceful manipulation was used to correct the tibial deformity (tibia vara, procurvatum and internal rotation) to achieve a normal femoral-tibial angle (Figure 2C). Final alignment was maintained with LCP fixation with 2 screws on each bone segment (Figure 2D). The wounds were closed primarily. We closely monitored the neurovascular status for 24 hours postoperatively. The patient was discharged from the hospital within 2 days, and allowed non-weight bearing ambulation. The wound healed without complication and the tibia united as expected (Fig. 3A, 3B). We have performed this minimally invasive technique in about 10 patients, and have had success using fix-angled plate fixation with LCP to hold the final correction.

DISCUSSION

A variety of proximal tibia osteotomy techniques have been advocated to correct the multiplanar deformities in Blount's disease. However, irrespective of the type of osteotomy and fixation device, there is always a risk of neurologic injury and compartment syndrome with acute correction.[3] Despite carefully protecting the neurovascular structures and even prophylactic fasciotomy, up to one-third of patients may have transient or permanent neurologic injury postoperatively [4, 5]. Closed wedge osteotomy often worsens preexisting limb shortening and may compromise metaphyseal bone stock.

The new osteotomy technique reported here for the proximal tibia can be performed in a minimally invasive manner, thus

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Fig. 1: Pre operative radiograph of both knees showing bilateral genu varum deformity worse on the left side.

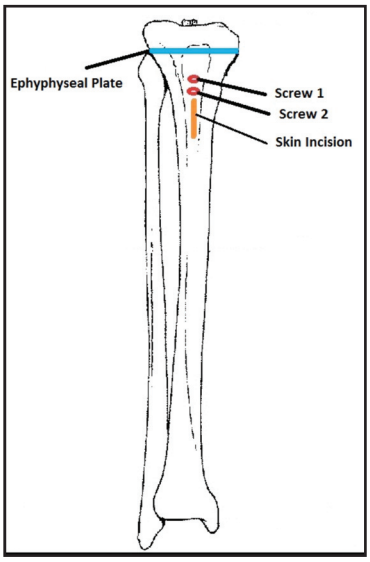

Fig. 2A: Pre-operative planning: to identify locations of screw no.1 and no.2 below the ephyphyseal plate (guided by fluoroscopy) using LCP as a template. Skin incisionwill be just below the distal screw.

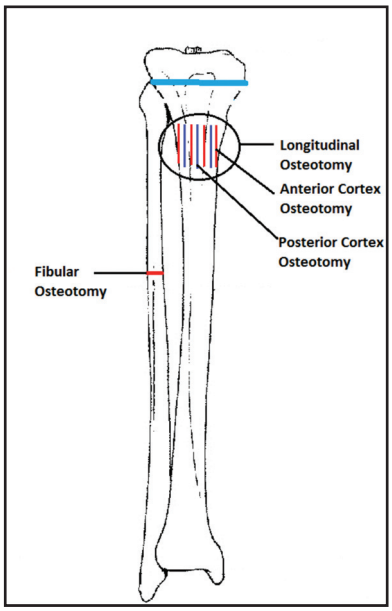

Fig. 2B: Longitudinal osteotomies of approximately 4 cm length at the anterior, medial and lateral side of the tibia with oscillating saw. Distance between the osteotomies is about 0.5 cm. About 0.5 cm of fibula will be removed.

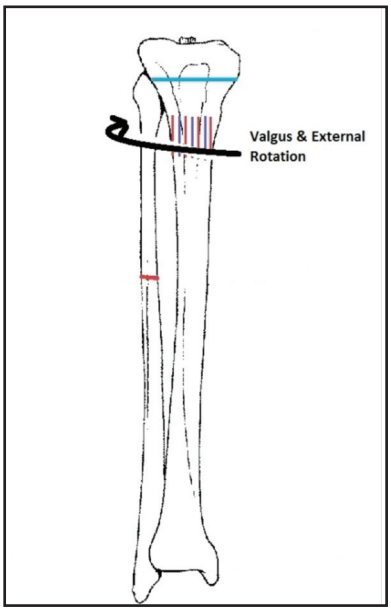

Fig. 2C: Valgus and external rotation correction performed until cracking sound can be heard. Desirable alignment confirmed clinically and with the use of radiography.

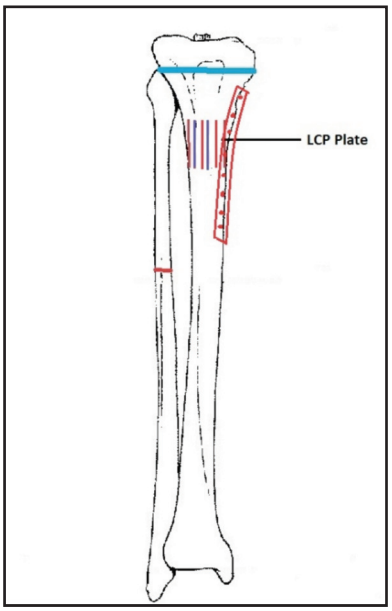

Fig. 2D: Close the periosteum with interrupted suture. Locking plate fixation performed with minimally invasive technique.

Fig. 3A: Post operative picture of lower limbs showing minimal scarring following surgery.

Fig. 3B: Post operative radiographs of the left knee taken during follow up.

we do not recommend prophylactic fasciotomy. The osteotomy is performed subperiosteally with minimal disturbance of the periosteum, and the surrounding soft tissue surround is also minimally manipulated. The multiple parallel longitudinal osteotomies allow plastic deformation at that level and help to maintain the final alignment before plate fixation is performed, resembling a bending bamboo stalk. Bone healing is also improved by the periosteum and soft tissue preservation. In other words, healing following this procedure simulate that of an incomplete greenstick fracture. We did not feel that fasciotomy was necessary in the procedures performed to date and have not come across postoperative compartment syndrome or evidence of Volkman's ischaemia on follow up. However, close observation for vascular and neurological deficit 24 hours after surgery is necessary. Although we were not able to demonstrate some of these potential benefits with a single case, we hope to be able to present outcome study of a bigger series in the near future.

The "bamboo" osteotomy technique for Blount disease allows multiplanar correction, provides better stability after correction and can be expected to heal faster that conventional open wedge osetotomy. The technique may also prove to be useful for other types of bone deformity.

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