
Case 67: Clubfoot Sequela Treated with a Multilevel, Hexapod, External Fixator

Pablo Wagner and John E. Herzenberg

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Abstract

Clubfoot deformity is best addressed in young children with serial casting and Achilles tenotomy. When the window of opportunity for nonoperative treatment has passed, children will benefit from surgical correction. However, even with surgery the talipes equinovarus position is undertreated and persists into adulthood. In this case we present an 18 year old male with a history of surgically corrected clubfoot as newborn. He presented with ankle, knee, and back pain and a varus-procurvatum distal tibial deformity and a 3.5 cm tibial shortening. A double-level hexapod external fixator was used to correct the supramalleolar varus and tibial shortening. An aligned limb with no length discrepancy was achieved at the end of the correction.

1 Brief Clinical History

An 18 year old male presented to the office with a history of a partially surgically corrected clubfoot as newborn. The deformity evolved as the patient grew, resulting in a right supramalleolar varus deformity and a short tibia. The patient started with right lower extremity pain at the age of 12. At 18 years of age, the patient came to the office with a chief complaint of ankle, knee, and back pain that partially improved with a shoe lift. A surgical correction was indicated to correct the distal tibial deformity.

2 Preoperative Clinical Photos and Radiographs

See Figs. 1, 2, 3, 4, and 5.

P. Wagner (✉) • J.E. Herzenberg
Rubin Institute for Advanced Orthopedics, International Center for
Limb Lengthening and Reconstruction, Sinai Hospital of Baltimore,
Baltimore, MD, USA
e-mail: pwagnerh1@gmail.com; jherzenberg@lifebridgehealth.org;
frsc@aol.com



Fig. 1 Note the equinus and varus deformity. The smaller calf of the affected side is evident



Fig. 2 Distal tibial varus deformity showing a plantigrade foot through subtalar compensation

3 Preoperative Problem List

Distal tibial varus-procurvatum deformity
Tibial and peroneal nerve at risk
3.5 cm tibial shortening

4 Treatment Strategy

Supramalleolar osteotomy (SMO) to correct deformity
Peroneal nerve release to prevent injury
Anterior compartment fasciotomy to prevent compartment syndrome
Tarsal tunnel release
Gastrocnemius recession (Vulpus)
Proximal tibial osteotomy: for lengthening
External fixation to allow for gradual correction of deformity and shortening

5 Basic Principles

A single-level distal tibial TSF to correct the varus-procurvatum and shortening could have been an option. However, in order to decrease the stress on the soft tissues and the ankle joint, a double-level deformity correction was performed. The lengthening through the proximal osteotomy



Fig. 3 Saltzman view showing the distal tibial varus



Fig. 4 AP tibias showing the right distal varus

stretches only the gastrocnemius. On the other hand, lengthening through a distal tibial osteotomy stretches all tendons around the ankle joint, the joint itself, and the neurovascular bundle. In cases of equinus and varus correction, an Achilles lengthening procedure and tarsal tunnel release have to be performed prior to the external fixator placement. For a double-level tibial osteotomy, it is recommended to perform a prophylactic anterior compartment fasciotomy.

6 Images During Treatment

See Figs. 6, 7, 8, and 9.

7 Technical Pearls

Start with the soft tissue procedures (anterior compartment fasciotomy, tarsal tunnel release, and Achilles lengthening). Before placing the external fixator, perform an incomplete (2/3) Gigli saw SMO. The fixation of the distal tibial segment is with one full ring with at least one wire and a pin. For better stability, add a foot ring with calcaneal fixation wires.



Fig. 5 Distal tibial procurvatum



Fig. 6 Incomplete SMO

8 Outcome Clinical Photos and Radiographs

See Figs. 10 and 11.

9 Avoiding and Managing Problems

Start your surgery with a tourniquet, and do a tarsal tunnel release and passage of the Gigli saw around both the tibia and fibula, no more than 2 cm above the joint. Activate the Gigli saw and cut through the fibula and half way through the tibia, but do not complete it until the end of the procedure after the frame is fully applied, as it would be unstable. If you inadvertently complete the Gigli saw cut prior to frame mounting, stabilize the osteotomy temporarily with crossing wires.

Include both pins and wires in the distal tibial segment, to prevent wire cutout through the osteopenic bone.

Slight overcorrection into the valgus may be desirable in case decreased ankle joint space is present, in order to prevent overload of the medial cartilage.



Fig. 7 Proximal tibial TDSF

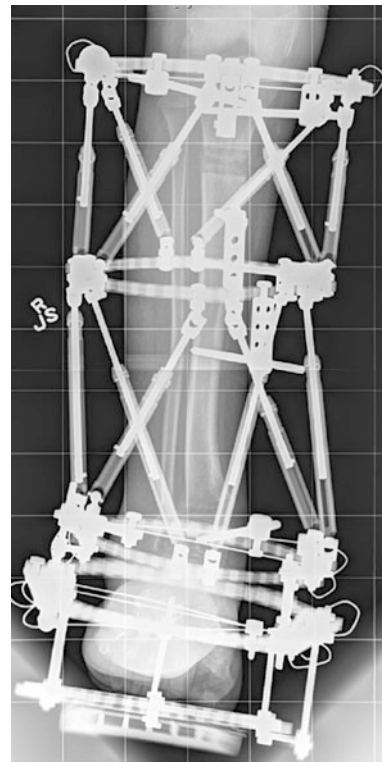


Fig. 9 AP tibial X-ray: double-level TDSF for proximal lengthening and distal varus correction

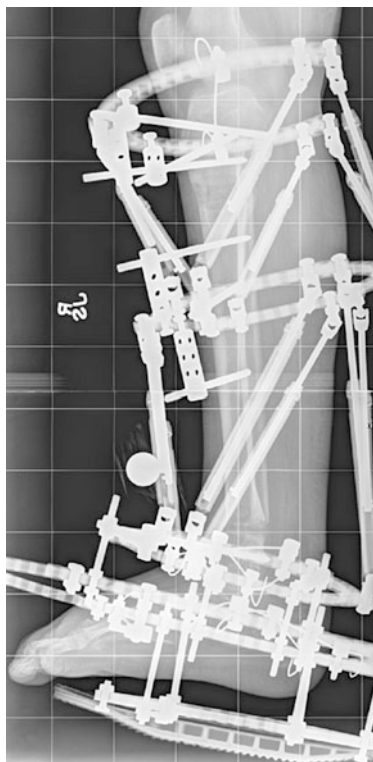


Fig. 8 Lateral tibial X-ray: double-level TDSF for proximal lengthening and distal varus correction



Fig. 10 Post ex fix removal: AP tibia



Fig. 11 Post ex fix removal: lateral tibia

11 See Also in Vol. 1

Case 94: Correction of Tibia Recurvatum and Shortening in Skeletal Dysplasia

References and Suggested Reading

- Eidelman M, Katzman A, Zaidman M, Keren Y (2011) Deformity correction using supramalleolar gigli saw osteotomy and Taylor Spatial Frame: how to perform this osteotomy safely? *J Pediatric Orthop Br* 20(5):318–22
- Ganger R, Radler C, Handlbauer A, Grill F (2012) External fixation in clubfoot treatment – a review of the literature. *J Pediatr Orthop B* 21(1):52–8
- Horn DM, Fragomen AT, Rozbruch SR (2011) Supramalleolar osteotomy using circular external fixation with six-axis deformity correction of the distal tibia. *Foot Ankle Int* 32(10):986–93
- Hsu LP, Dias LS, Swaroop VT (2013) Long-term retrospective study of patients with idiopathic clubfoot treated with posterior medial-lateral release. *J Bone Joint Surg Am* 95(5):e27
- Vitale MG, Choe JC, Vitale MA, Lee FY, Hyman JE, Roye DP Jr (2005) Patient-based outcomes following clubfoot surgery: a 16-year follow-up study. *J Pediatr Orthop* 25(4):533–8

10 Cross-References

- ▶ [Case 52: Ankle Distraction and Supramalleolar Osteotomy for Arthrosis and Deformity](#)