Case 17: Tibial Atrophic Nonunion with Deformity and 4 cm LLD

Mahmoud A. El-Rosasy

Contents

Abstract

The use of distraction histogenesis, pioneered by Ilizarov, has solved several complex orthopedic problems. Among them is nonunion with deformity and limb shortening. Using Ilizarov techniques, the problems can be solved in one procedure.

1 Brief Clinical History

This is a case of a 28 year old otherwise healthy male patient who is a moderate cigarette smoker. Previously he had upper tibial osteotomy for correction of a genu varum deformity and tibial lengthening using a monolateral external fixator. The osteotomy failed to unite. The patient developed a nonunion, valgus deformity, and leg shortening of 4 cm. He also had equinus contracture of the ankle joint. He was treated by open lengthening of the Achilles tendon.

2 Preoperative Clinical Photos and Radiographs

See Fig. 1.

3 Preoperative Problem List

1. Atrophic nonunion of the upper tibia which was operated upon two times to achieve consolidation
2. Cigarette smoker
3. Tibial shortening 4 cm
4. Partially stiff ankle (ROM: ext. 5° and flex. 10°) and previously lengthened Achilles tendon

M.A. El-Rosasy (✉)
Faculty of Medicine, Department of Orthopaedic Surgery, University of Tanta, Tanta, Al-Gharbeya, Egypt
e-mail: elrosasym@yahoo.com

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Fig. 1 (**a**–**c**) Clinical photos show the shortening of the right leg and valgus deformity; (**d**, **e**) pre-operative radiographs show upper tibial nonunion with valgus deformity

Fig. 2 (**a** and **b**) Immediate post-operative radiographs demonstrate the application of Ilizarov external fixator for bifocal compression – distraction. The deformity was acutely corrected after square osteotomy of the bone ends. A distal tibial lengthening osteotomy was performed and the foot was included in the fixator

4 Treatment Strategy

The plan was to convert a complex limb reconstruction into a relatively simple linear limb lengthening through: (a) debridement of the nonunion site to achieve the best bone contact and acute deformity correction, (b) application of Ilizarov external fixator for compression of the nonunion and equalization of leg lengths through a distal tibial lengthening osteotomy, and (c) inclusion of the foot in the fixator to avoid development of equinus contracture during lengthening.

5 Basic Principles

The patient should be educated regarding the use of cigarette smoking and its deleterious effects on bone healing. The lengthening osteotomy should proceed slower than usual (0.5 mm per day). The possibility of delayed consolidation of the nonunion should be considered, and an autogenous iliac crest bone grafting is to be performed if the nonunion failed to show consolidation after 3 months. The patient is allowed weight bearing as tolerated during treatment, and the foot piece of the device is to be removed after the distraction phase to allow full weight bearing.

6 Images During Treatment

See Figs. 2 and 3.

7 Technical Pearls

Square osteotomy of the nonunion site serves two purposes: it allows acute deformity correction without neurovascular injury and maximum bone contact with an inherently stable bone configuration. Foot inclusion in the device prevents equinus contracture, and this should be removed at the end of the distraction phase.

8 Outcome Clinical Photos and Radiographs

See Fig. 4.

9 Avoiding and Managing Problems

A nonunion with a history of previous surgery frequently fails to unite unless aided by autogenous bone grafting. Limb reconstruction for a smoker patient should be judiciously executed due to compromised bone healing. Weight bearing during treatment is helpful to avoid disuse regional osteoporosis and muscle wasting, to stimulate bone healing and improve the patient's quality of life.

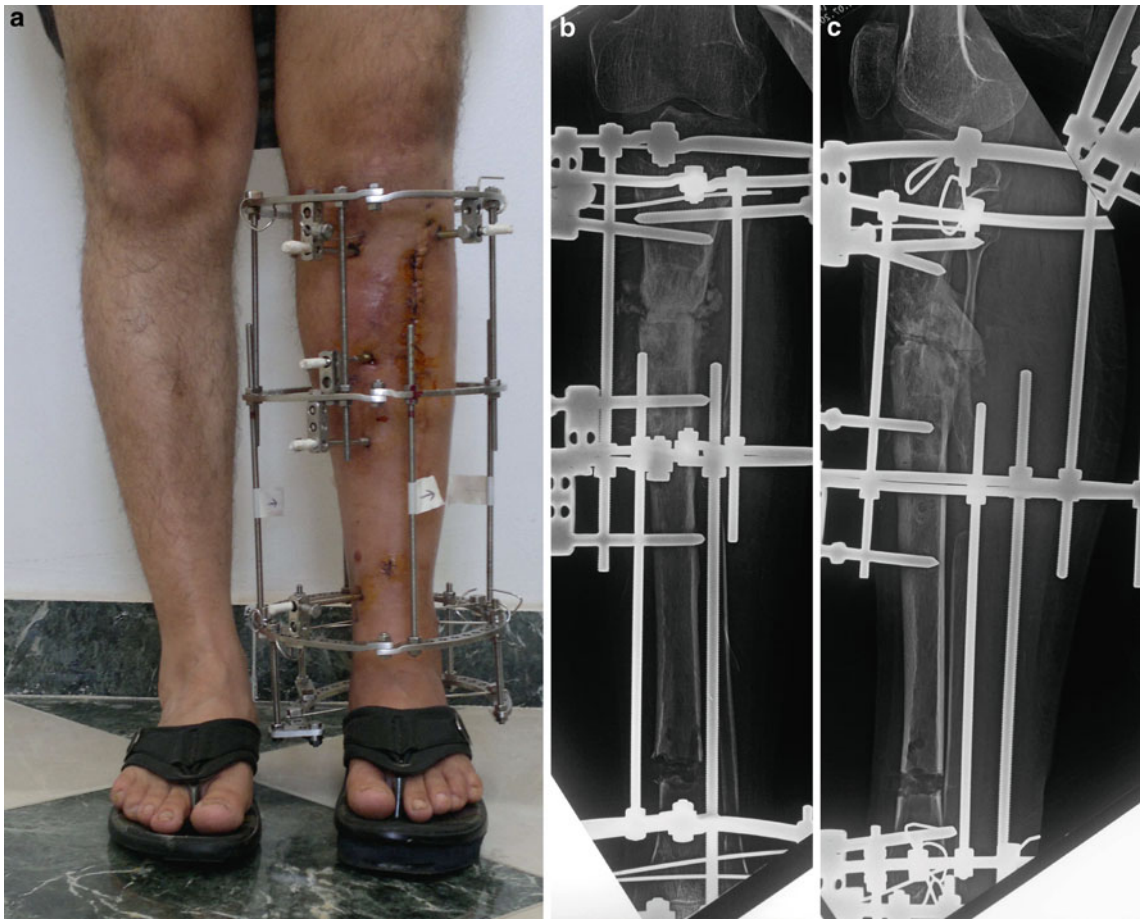

Fig. 3 (**a**) Clinical photo demonstrates the patient full weight bearing. The leg is well aligned. The ankle is fixed in the device, maintaining a plantigrade position, and a temporary shoe lift is utilized until the leg lengths are equalized. (**b** and **c**) Radiographs during treatment show bifocal compression distraction

Fig. 4 (**a**–**c**) Follow-up clinical photos show well-aligned leg, full range of motion of the knee, and plantigrade position of the ankle joint. (**d**, **e**) Follow-up radiographs show consolidation of the nonunion after autogenous iliac crest bone grafting. The distal tibial lengthening site is also consolidated

10 See Also in Vol. 1

Case 34: Recalcitrant Congenital Pseudarthrosis of the Tibia

References and Suggested Reading

El-Rosasy MA (2007) Acute shortening and re-lengthening in the management of bone and soft-tissue loss in complicated fractures of the tibia. J Bone Joint Surg Br 89(1):80–88

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