

Case Report Deformity correction in a case of right tibial hemimelia in an adult

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ARTICLE INFO

Article history: Received 19-07-2024 Accepted 25-08-2024 Available online 24-12-2024

Keywords: Deformity correction Tibial hemimelia Corticotomy Ilizarov external fixator Slotted plate 1

ABSTRACT

In this case report, deformity correction in a case of right tibial hemimelia with shortening is presented. The complex deformity warranted the use of Ilizarov frame, providing a versatile fixation system for the management of bony deformities and their complications.

A 17-year-old female patient presented with a congenital deformity of right leg and foot. She had complaints of chronic non-healing trophic ulcers on the lateral aspect of the right foot, a malformed distal tibia, and foot in equino-varus, along with 12 cm of shortening on the right side. Deformity correction of foot was sequentially achieved with distal tibia anterolateral closed wedge osteotomy fixed with plate which was later converted to Ilizarov fixator while limb lengthening was done with a slotted plate. Deformity was corrected making the foot plantigrade. 6 cm of lengthening was achieved. Complications like skin necrosis and severe pain were encountered during the course of treatment. They were dealt with successfully. Deformity Correction in tibial hemimelia using Ilizarov External Fixator aids in early mobility. However, care should be taken to address many complications that present due to abnormal anatomy.

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1. Introduction

Ilizarov frames provide a versatile fixation system for the management of bony deformities, fractures and their complications. The frames give stability, soft tissue preservation, adjustability and functionality allowing bone to realise full osteogenic potential. In cases of congenital deformity, most structures in question are rudimentary, malformed or even absent. Deformity correction and lengthening in such cases requires thorough examination of the patient, alongside extensive investigations to chalk out the abnormal anatomy. Here, we present a case of deformity correction in a case of right tibial hemimelia in adult.

2. Case Presentation

A 17-year-old female patient presented with congenital deformity of right leg and foot. She had complaints of callosities on the lateral aspect of the foot, as that was her weight bearing portion. Diagnosis of tibial hemimelia was made upon history and radiological findings. This tibial hemimelia of Paley type 2C.^{1,2} The hips, knee, and left ankle joint was normal (Figures 1 and 2).The neurological examination of both lower limbs was normal. The patient wanted a plantigrade foot and limb lengthening to alleviate the back pain and contralateral knee pain.

Treatment was staged as follows:

- 1. Anterolateral close wedge osteotomy fixed with a distal end radius (DER) plate and tibial lengthening with 6 cm slotted plate and corticotomy
- 2. Revision of ankle correction by plate removal and Ilizarov fixator application to foot

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Figure 1: Pre-operative clinical pictures

- 3. Strayers release
- 4. Ilizarov removal

Prior to surgery, an MRI scan and doppler study was undertaken to delineate aberrant vessels and structures which might pose risk during surgery. It suggested an altered course of dorsalis pedis artery and posterior tibial artery. The nerves were normal in course. Posterior tibial tendon, peroneal tendons and tendoachilles were rudimentary distally. We marked the dorsalis pedis artery and posterior tibial artery with a doppler prior to incision.

An anterolateral incision on the distal tibia was taken after inducing the patient under spinal anaesthesia. The soft tissues were carefully dissected, and distal tibia was approached. Image Intensifying Television (IITV) was used to check the position of the wedge to be excised and marked with K-wires. With a mini saw the predetermined wedge was removed and deformity was corrected. The distal pulses were palpable despite the 1 cm of shortening caused. A DER T-plate 3(H) was contoured, and the osteotomy was fixed. The wound was closed. The surgery was continued proximally and as a standard procedure the limb lengthening with slotted plate was performed.^{3,4} Postoperative period was uneventful, however after one week the lateral skin callosity started to blacken with a superficial eschar. It was manged by regular dressing, and it healed well. Gradual distraction at the speed of 1 mm/ day was initiated after 10^{th} day and progressed smoothly (Figures 3 and 4).

The foot deformity needed further correction to plantigrade, thus one month later it was revised to an Ilizarov foot frame by removing the plate placed in situ. Further correction was possible and plantigrade foot was achieved (Figure 5). As the lengthening continued, the patient experienced pain, which was increasing daily. Thus, a third surgery of Strayers release was performed. She was walking bearing full weight on the fixator thereafter.



Figure 2: (A) to (I): Pre operative x-rays

3 months after achieving 6 cm of lengthening, the distal screws of the slotted plate were locked and Ilizarov fixator was removed (Figure 6).

The foot ring was removed 1 month thereafter, and a protective above knee cast was applied for 3 weeks (Figure 7).

3. Results

Deformity correction achieved. Total duration of treatment was of 5 months. Good regenerate was visible along the treatment. 6 cm of lengthening was achieved in 3 months. Ring fixator for foot was kept for 3 months and was removed 1 month after the tibial rings were removed. Patient is walking with a plantigrade foot, and a shoe raise to



Figure 3: Intraoperative 1^{*st*} stage correction: **A**): rudimentary TA, **B**): osteotomy marking, **C**): anterolateral wedge osteotomy, **D**): closed wedge osteotomy, **E**): plantigrade foot, **F**): slotted plate



Figure 6: X-rays after 3^{rd} stage surgery: **A):** proximal rings removed, **B):** distal locking of slotted plate



Figure 4: Post operative X-rays after 1st stage surgery



Figure 7: X-rays after 4^{th} stage surgery: A): Ilizarov fixator removed, B): above knee cast given



Figure 5: X-rays after 2^{nd} stage surgery: A): DER plate removed, B): foot ring added



Figure 8: 4 months follow up X-rayafter 4th stage surgery



Figure 9: Follow up clinical pictures at 7 months after 4th stage surgery

accommodate the remaining of 6 cm of tibial shortening (Figures 8 and 9). Complications like pain and skin necrosis were encountered during the treatment. They were dealt with effectively.

4. Discussion

Deformity correction in congenital cases is very challenging. Correction in such patients is difficult as the structures are rudimentary $5-7^{-7}$ and the behaviour of neurovascular structures cannot be predicted in acute correction.⁸ Hence, stage wise correction is advised. Correction in our patient was achieved over a period of 5 months in 4 stages of surgery. Many authors suggest below knee amputation for cases of tibial hemimelia, but according to Paley,^{1,9} correction of foot deformity to plantigrade and lengthening gives a functional limb. An article by Yadav enumerated the result of femoralfibular-calcaneal fusion at early age, 10 but in this case, as the ipsilateral knee and femur were normal and ankle already fused, the correction of deformity with length sufficed. It can be thus stated, that here amputation was avoided and functional limb was salvaged by the given treatment.¹¹ One article by Balci. H states the importance of knee stability for deciding the treatment course.¹² Many authors now believe reconstruction can be the new road for tibial hemimelia.^{11,13,14} Certain complications should be anticipated and addressed like pain, compartment syndrome, nerve injuries and so on. 15,16

5. Conclusion

Deformity Correction in congenital cases requires staged surgery. Ilizarov External Fixator allows constant Length and Angular adjustments leading to better patient outcomes.

6. Conflict of Interest

None.

7. Source of Funding

None.

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Cite this article: Kulkarni MS, Vishwakarma UK. Deformity correction in a case of right tibial hemimelia in an adult. *Indian J Orthop Surg* 2024;10(4):382-385.