Multi-stage correction of shortening and deformities of the lower leg in children and adolescents with an external fixation device according to ilizarov

Abstract
Ilizarov Technique is a fantastic tool for correcting Shortening and deformities of the lower leg in children and Adolescents. The principle of compression-distraction histiogenesis of bone and soft tissue is the basis of treatment of the Ilizarov ring fixator. Distraction histiogenesis generates new bone and soft tissue under gradual distraction. All my research was carried out at Bari-Ilizarov Orthopaedic Centre from Jan 2013 to Dec 2022.

Introduction
Deformities of limbs may be congenital and can become apparent in early childhood. The concerned bones are the femur, tibia, fibula, radius ulna and humerus. The bones of the head and foot may be involved too.1,2

Types of deformities of lower limb
Lower Limb Deformities may be:

- Non-unions
- Genu Varum
- Genu Valgum
- Limb Length Discrepancy
- Procurvatum
- Recurvatum

Patient criteria
Children to adolescents- age ranged from 3yrs. to 17 years.3
LLD of lower limb (femur/tibia) with Osteomyelitis
Non-unions
Pathological fractures
Number of patients: 34
12 females, 22 males

Limb lengthening
By small incision the bone is cut, and Ilizarov device is applied on limb.

The devices gradually pulled; apart the fragments from each other leading to new bone (callus) formation. [LAW OF TENSION STRESS]4

Bone and soft tissues can grow under mechanical tension which is very close to natural growth.

Corticotomy is a Low energy Osteotomy with the preservation of-
Periosteum
Endosteum
Bone Marrow
Ilizarov classical corticotomy…….all wires frame

Treatment options
By Ilizarov

Biological parameters
0.25mmX4 times a day 0.125mmX8 times a day
60 times a day by automatic distractor5

Results
From January 2013 to December 2022, 34 patients with shortening and Deformities of The Lower Leg were treated by Ilizarov. The average time of treatment was 6 months (range 4-12 months). Osteogenesis and tissue genesis of the distraction gap was achieved in all the 34 patients. There were no incidents of neurovascular complications.

Conclusion
Ilizarov technique is a promising method that can be used for correcting deformities of the limbs. It can be applied at multiple levels of the affected limb. Sometimes, two or three steps surgery is required.
Case 1:

i. 5 years old boy 4 cm LLD Lt tibia/fibula é varum deformity. (Front view)

ii. 5 years old boy 4 cm LLD Lt tibia/fibula é varum deformity. (Back view)

iii. X-ray showing Cora and LLD

iv. Patient with Ilizarov apparatus

v. 8 cm LLD at age 11 (Front view)

vi. 8 cm LLD at age 11 (Back view)

Citation: Bari AMSR, Bari MM, Islam S. Multi-stage correction of shortening and deformities of the lower leg in children and adolescents with an external fixation device according to ilizarov. MOJ Orthop Rheumatol. 2023;15(3):112–116. DOI: 10.15406/mojor.2023.15.00629
vii. LLD visible in lying position
viii. X-ray showing LLD of left tibia/fibula by 8 cm
ix. Patient with Ilizarov apparatus
x. X-ray showing lengthening of both upper and lower tibia/fibula
xi. After full correction (Front view)
.xii. AP view of left tibia/fibula after full correction
xiii. Lateral view
xiv. Final follow up at the age of 17 (12 years follow up)
xv. Back view with full knee flexion
xvi. Final follow-up of x-ray.

Case 2:
Multi-stage correction of shortening and deformities of the lower leg in children and adolescents with an external fixation device according to ilizarov

i. Chronic osteomyelitis é pathological fracture Rt femur of 4 years old boy é discharging sinus (Front view)

ii. Chronic osteomyelitis é pathological fracture Rt femur of 4 years old boy é discharging sinus (Back view)

iii. Pathological fracture Rt femur (X-ray)

iv. Patient with Ilizarov apparatus

v. X-ray showing union of femoral shaft

vi. Weight bearing with Ilizarov frame

vii. After Removal of frame (Back view)

viii. Front view after removal

ix. X-ray of Rt femoral with 12.5cm LLD at age 13

x. 12.5 cm LLD (Front view)

xi. 12.5 cm LLD (Back view)

xii. After application of Ilizarov in both femur and tibia/fibula

Citation: Bari AMSR, Bari MM, Islam S. Multi-stage correction of shortening and deformities of the lower leg in children and adolescents with an external fixation device according to ilizarov. MOJ Orthop Rheumatol. 2023;15(3):112–116. DOI: 10.15406/mojor.2023.15.00629
xiii. Stress X-ray showing 12.5 cm LLD Rt femur
xiv. X-ray of Rt hip to knee showing lengthening of femur
xv. X-ray of Rt tibia/fibula showing lengthening going on
xvi. After removal of frame and application of full plaster
xvii. After removal of plaster
xviii. Application of brace for support
xix. Stress x-ray showing full correction of LLD
xx. Final follow up at age 14 after 11 months of treatment
xxi. Stress X-ray showing full correction

References

2. Bari MM. Correction of leg deformities and restoration of function of leg bones by ilizarov technique A color atlas of limb lengthening, surgical reconstruction and deformity correction by Ilizarov technique. 2014. p. 35–121.