

Editorial

ILIZAROV: An Inspirational Leader in Orthopaedic Surgery

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There are many inspiration leaders in the history of medical science whose impact on mankind has been everlasting. Speaking of Orthopaedic Surgery, the name of Prof Ilizarov is among such leaders. His innovation and astounding legacy is a blessing for the patients who would otherwise face catastrophic consequences.¹⁻³

Gavril Abramovich Ilizarov was not a trained Orthopaedic Surgeon however his passion to save the limbs led him to develop a revolutionary biological phenomenon, 'Distraction Osteogenesis' which refers to bone formation between two distracted fragments through the use of a modular external ring fixator and transosseous fixation wires. In his first ever American literature published states, 'Gradual traction on living tissues creates stresses that can stimulate and maintain the regeneration and active growth of certain tissue structures. This principle is called the Law of Tension-Stress.'²⁻⁴

He pioneered the concept of ring external fixator. In Ilizarov surgeries, stainless steel (or carbon fibre) rings are fixed to the bone via stainless heavy gauge wires called Kirschner wires or K-wires which pass through the bone. After giving tension, these wires are fixed to encircling rings with nuts and bolts. The external rings are linked to each other by threaded rods and hinges that allow moving the position of the bone fragments without opening the fracture site, then the fragments can be fixed in rigid position until complete healing. The circular construction and tensioned wires of the Ilizarov apparatus provide far more structural support than the traditional fixator system. The Ilizarov frame act as a suspension bridge (beam loading), both immobilizing the fracture site and relieving it of excessive stress, while allowing for the movement of the entire limb. This allows early weight-bearing and return of function quicker for patients, the key to the Ilizarov technique.¹⁻²

Adjustments in the rods can be used to produce compression and distraction as desired between the bone ends. Simultaneously it corrects deformities. In addition to being used to treat a fractured limb, the Ilizarov frame is also commonly used to correct deformity through distraction osteogenesis. In this surgery, the ring fixator is applied and the bone is surgically fractured (corticotomy). Within few days, the fractured bone begins to heal with soft callus. While the bone is growing, the frame is adjusted by means of turning the nuts, thus increasing the space between two rings. As the rings are connected to opposite sides of the fracture, turning of nuts moves the now-healing fracture apart 0.25 mm at a time, 4 times per day totaling 1 mm per day. The incremental daily increases result in a considerable lengthening of the limb over time. A further use is of bone transport, whereby a defect in a long bone can be treated by transporting a segment of bone, whilst simultaneously lengthening regenerate to reduce the defect and finally dock with the other segment, producing a single bony unit.¹⁻²

There are numerous advantages of this novel technique. Incidents of tissue trauma, hemorrhage and infection are much fewer when compared to conventional operations as no skin incision is made. It is minimally invasive procedure. Only wires and rings are used to fix the bones. Thus there is very little soft tissue damage. The cylindrical shape of the Ilizarov fixator makes it possible to correct the deformities in 3 dimensions simultaneously. This proves versatility of Ilizarov apparatus. The patient can move throughout the treatment procedure. Problems of contractures and joint stiffness are thereby reduced. The patient's stay in the hospital is reduced for considerable period of time.¹⁻³

For a developing country like ours with limited health facilities, Ilizarov technique is a bright light of hope. Our tertiary care hospitals receive number of complicated

and neglected patients in which Ilizarov is the only treatment option. Along with treating simple and complex fractures and skeletal deformities, limbs of many such patients could be salvaged who were referred for amputations. These patients include bony tumours, stubborn infections and bone defects. One of the biggest advantages of this technique is that average cost of one frame is between ten to fifteen thousand rupees. Need is to train Orthopaedic surgeons in this method and develop specialized and dedicated Ilizarov centers in Pakistan.

References

1. Aronson J. Limb-lengthening, skeletal reconstruction, and bone transport with the Ilizarov method. *J Bone Joint Surg Am* 1997;79(8):1243-58
2. Ledford C, Garrigues GE, Fitch RD. Ilizarov: The man, the myth, the method: an orthopaedic inspiration. *The Duke Orthop J* 2013;3(1):104-7
3. Ilizarov.ru [Internet]. Kurgan, Russia: Russian Ilizarov Scientific Center for Restorative Traumatology and Orthopaedics; c2012 [updated 23 May 2013; cited 10 Oct 2013]. Available from: <http://www.ilizarov.ru/en>
4. Ilizarov GA. The tension-stress effect on the genesis and growth oftissues: Part II. The influence of the rate and frequency of distraction. *Clin Orthop Relat Res* 1989;239:263-85