ILIZAROV- The revolution of orthopedics: A prospective study in hospital and clinic
Hossain MA, Masud MH, Hossain A, Eskander F

Summary
A prospective study was done on 51 patients, who were treated at National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR) and in private clinics from May1999 to May2002. Among them 41(80%) patients were treated for non-union, 3(6%) patients were treated for mal-union and 7(14%) were treated for deformed limbs. They were all treated with Ilizarov external fixator.

Introduction
Why we called the Ilizarov method - The revolution of orthopedics? Because when there is no appropriate answer to the problem of orthopedics and traumatology, Ilizarov method comes to solve the problem. For example when a patient comes to the orthopedic surgeon with non-union of a fracture after being treated with plating, intramedullary nailing, monolateral external fixators or other methods, Ilizarov can lead the surgeon to the destination, i.e. union of the fracture. Previously a crushed limb could not be saved and amputation was the only solution. But now with the Ilizarov we can save the limb and to make the patient hope full. Multiple deformities are amenable to correction by Ilizarov, which an orthopedic surgeon could not think in past.

The Ilizarov method, pioneered by Gavriil Abramovich Ilizarov in Kurgan, Russia has evolved a technique using and innovative modular circular external fixator based on the biological principle of distraction neohistogenesis. Living tissue exposed to the stress of gradual traction becomes metabolically active and under goes regeneration and active growth. Ilizarov calls this new principle as the law of tension stress and has successfully applied his method to correct a wide variety of orthopedic problems, including fractures, malunions, nonunions, congenital deformities, osteomyelitis, limb-length inequalities, joint contractures, arthritis, short amputation stumps, soft tissue defects, cosmetic bone abnormalities and occlusive vascular disease.

1. Dr. M. Amjad Hossain - MBBS, MS (ortho), Prof. & Head of the Dept. of Orthopedics Surgery, DMCH
2. Dr. Md. Hasan Masud - MBBS, MS(ortho), Assistant Registrar, Green Unit, NITOR, Dhaka.
3. Dr. Amir Hossain , MBBS, MS(Ortho), Consultant, NITOR, Dhaka.
4. Dr. Faisal Eskander - MBBS, Emergency Medical Officer, BIRDEM

Limb lengthening is possible and has been performed successfully for about 50 years in Kurgan, Russia. Gavriil A. Ilizarov developed the concept in 1951 after seeing many second world war victims, who had leg fractures that had not healed (nonunion).
Limb lengthening and reconstruction techniques can be used to replace missing bone and lengthen and/or straighten deformed bone segments. The procedures may be performed on both children and adults who have limb length discrepancies due to birth defects, diseases or injuries. The regenerated bone is normal and does not wear out. The muscles, nerves and blood vessels grow in response to the slow stretch like they do during a growth spurt or in pregnancy. The actual procedure is minimally invasive and requires only one or two nights in the hospital. The patients aren't in much pain since the distraction is so gradual and patients can continue to work during treatment. The present paper describes exclusively with the use of Ilizarov method in the management of non-union, malunion and correction of deformities.

**Subjects and methods**
A prospective study was done on 51 patients attending NITOR and private clinics over the period from May 1999 to May 2002 and done by group of surgeons under direct supervision of the chief surgeon. During this period total 60 patients were selected but 09 patients were lost from the follow-up. Among them 41 (80%) were males and 10(20%) were females. Their average age was 21.61 years (range 2-60 years). The mean time between the initial injury and the application of Ilizarov frame and ring was 8 months.

<table>
<thead>
<tr>
<th>Defects</th>
<th>Age (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-union</td>
<td>2-60 years (Mean 33.36 years)</td>
</tr>
<tr>
<td>Mal-Union</td>
<td>6-37 years (Mean 24.33 years)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Deformed limbs</th>
<th>Congenital</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Club foot</td>
</tr>
<tr>
<td></td>
<td>Bowing of leg</td>
</tr>
<tr>
<td>Acquired-</td>
<td>Leg length descrepancy</td>
</tr>
<tr>
<td></td>
<td>Equinovarus deformity</td>
</tr>
</tbody>
</table>

The cases in our series were non-union 41(80%), mal-union 3(6%) and deformed limbs 7(14%). Among the deformed limbs congenital deformities were club foot, bowing of leg, and acute deformities were leg length discrepancy and equino-varus deformity.

Complications of Ilizarov technique in our series were pin tract infections. Though hospital staying is very short but to keep Ilizarov frame in the limb for a long period may not be accepted by all patients.

**Technique**
The Ilizarov external fixator is a circular frame consisting of half rings, 5/8 rings, threaded connecting rods, Ilizarov wires, connection plates, hinges, posts, washers, nuts, and bolts. With these basic components, different frame configurations can be assembled. The key to success with Ilizarov fixator is pre-operative planing. Full length anteroposterior and lateral radiographs of the bone, including the joint above and below must be obtained. These full-length radiographs are used to select threaded rods of proper length and approximate ring location. Proper ring diameter is to be determined by uninjured extremity of the patients. After standard preparation and draping of the extremity the ring connection bolts on one side of the pre-assembled frame are disconnected and the frame is hinged open. The k-wires are introduced through the safe zones to avoid the neurovascular bundles. As the wires are secured to the frame and tension is applied the correction of deformity is achieved. Further correction can be achieved by olive wire.1,2

Traditionally, corticotomy or compactotomy has been performed in the metaphysis or...
metaphyseal - diaphyseal junction to yield regenerate bone of the greatest cross section in the hope of decreasing time to removal.

Skin and other soft tissues are handle with care. 1.5 to 1.8mm wire needs no incision, but 2mm or larger wires or olive wire needs a small incision of skin only. Wires that have a special self drilling cutting tip require no pre drilling.

The delay between corticotomy and the commencement of distraction was 7-14 days. Compression at the fracture site and distraction at corticotomy site are done simultaneously if needed.

**Results**

Of the 51 patients, 41(80%) were non-union, 3(6%) were mal-union and 7(14%) were deformed limbs.

In our cases the average time of union was 4-3 months but it varied widely due to variation in bones like humerus, femur or tibia. No bone graft was necessary in these cases. Ilizarov rings were maintained for an average of 8 months and on an average 5cm. bone loss corrected.

Among the complications of Ilizarov 11(22%) cases were pin tract infection, 3(6%) were nerve injury (neurapraxia)-common peroneal nerve injury, radial nerve injury and these were spontaneously corrected in time, 5(10%) cases were ankle equinus, 2(4%) cases were angulation deformity (valgus or varus).

The rate of distraction was 1.0mm/day divided into four 0.25mm distraction. Later the patient could do the distraction by himself/herself by marking the screw with colorful substance like nail polish. We had a gap of 7-14 days from corticotomy time to distraction time.

**Discussion**

We managed the problems of non-union, mal-union, deformity mainly in lower limb and to a lesser extent in upper limbs (in humerus).

In our series 41(80%) patients were of non-union, 3(6%) were of mal-union and 7(14%) were of various deformity. Among the deformities there were congenital deformities - club foot 2(4%), bow leg 2(4%) and acquired deformity -leg length discrepancy 2(4%) and equino varus deformity 1(2%).

**Conclusion**

The problems of non-union or mal-union or deformed limbs burns in the flame of Ilizarov. As we can give axial loading at the fracture site, so Ilizarov method is the best method for stabilization and rigid fixation. Time has come to spread the spirit of Ilizarov procedure to every district of Bangladesh. It should be mentioned here that for this method we can use custom made instrument and implants, in stead of foreign instrument and implants.

**References**