

LIMB LENGTHENING

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Patients who have developed Post-Polio Paralysis due to Poliovirus usually develop shortening of limbs. About 80-90% of the patients develop shortening to some degree. These children have normal mental development unlike children affected by Cerebral Palsy. They are unable to move freely and interact within society, because of the PARALYSIS. They lose the opportunity of schooling, playing, recreation, college education, marriage and socialising. They are shunned by the society. As their mental potential does not get developed they are forced to become dependent on society at large.

These children if given proper medical care and attention can become independent and useful citizens, who can earn their own livelihood and become productive members of society, without any social stigma. With this potential they can become artists, engineers, doctors, accountants, businessmen and anything they strive for.

One of the disabilities they face is SHORTENING of the limb, which can range from ½ inch to 4 inches. A patient having this shortening while walking on the affected side has to bring the leg down by increasing the curvature of the spine. The spine as a result becomes Scoliotic [increased curvature of spine on one side]. Shortening also puts extra strain on the joints of the spine, hip and knee, resulting in early ARTHRITIS and pain between 30 and 50 years of age. So, when an individual is in the prime age of earning (i.e. 30 to 50 years), he becomes incapacitated by pain of Arthritis. Whatever little mobility exists becomes less. This results in the danger of losing one's job, earnings and thus increasing the chances of dependence on the family and society.

Shortening can be temporarily corrected by application of extra thick sole to the shoe. Sometimes half inch of shortening is desirable, when the hip joint muscles are hopelessly paralysed, to clear the ground while walking. But, most of the patients do require correction by application of extra-thick sole in the shoe. This works very well when the patient is wearing the given shoes all the time, in and outside the house. Usually this does not happen as the patient removes the shoes in the house and moves about with a dipping gait.

A scientific study done shows, that polio patients spend more time in the house than outside. Callipers or boots given are worn only when the patient goes outside the house. The extra thick sole provided wears off with time, requiring repeated repairs and replacement. In a case with severe shortening, compensating with extra thick sole makes the shoes too bulky and aesthetically unacceptable. Also it becomes a source of discomfort, hindrance and discouragement, the weight becomes too much to cope with by the paralysed weak limb.

For such patients a new technique, which increases the length of the bone, can do wonders. This technique is called ILIZAROV'S TECHNIQUE. This operation is time consuming, difficult and requires a steep learning curve. Hence only few surgeons in big hospitals and big centres do it. The cost of this operation is prohibitive for the poor in India. In big centres this operation costs around 40,000 to 60,000 Rupees (i.e. US\$ 1200). Because of this, the advantage of this technique is not passed onto the poor, under privileged polio patients who require it the most.

The procedure of limb lengthening is done only when all Contractures are released and deformities corrected. IT CAN BE DONE AT ANY AGE. Before the operation a detailed examination is carried out and the amount of lengthening to be achieved is recorded.

The operation is done by application of two rings (sometimes four), one at each end of the bone. The rings are fixed to the bone by thin steel wires passing through the bone. The rings, in turn, are joined to one another by interconnecting rods called 'TELESCOPING RODS', 3-4 in number. The bone is cut in a special way through small incision. The cut bones are held together in the same position 8 to 14 days from the day of the operation. After this waiting period, the process of lengthening is initiated by rotating the NUTS on all the telescoping rods (usually 3). Before commencement of rotation, reference marks are made by colour, on the nuts and the telescoping rods. The nuts are hexagonal (i.e. It has six surfaces.) Each surface is turned 4 hourly and brought in front of reference mark of the telescoping rods. One surface when turned towards the reference mark of the telescoping rod rotates the nut by $1/6^{\text{th}}$ of a circle. In 24 hours, the nut rotates by 6 surfaces, thus completing one full circle of rotation. One full circle of rotation of the nut, in 24 hours, lengthens the bone by 1mm and 10mm in 10 days. In 25 days bone lengthening achieved is 25mm equal to about 1 inch.

The process of lengthening once started is continued until estimated shortening is corrected. For example, if shortening is 4 centimetres, then from the day of commencement of lengthening the nut rotation is done for 40 days. Once the desired length is achieved, the nut rotation on the telescoping rods is stopped. Thus accordingly, after the operation, the date of commencement of rotation of the nuts and the date of stopping of the rotation of the nuts are given to each patient, depending on the amount of the shortening recorded.

The timings and amount of rotation carried out, is extremely important. It has to be understood by the patients and their relatives properly. The timing of the rotation is to be followed strictly and religiously. The timing can be adhered to, by keeping an alarm-clock, which is set and reset to ring every 4 hourly. Once the alarm rings, it immediately reminds the patient and his relatives about the nut rotation to be carried out, on all the three telescoping rods in the desired direction, as advised. It should also be clearly understood that the nut-rotation carried out should neither be too fast nor too slow. If done faster (e.g. 2mm per day), to achieve extra length in short time, then instead of bone formation there will be a "Cyst" formation (Cyst means a hollow growth in the body containing liquid matter.) If done too slowly (e.g. ½ mm per day), then bones will join prematurely and further required length may not be achievable.

X-rays

X-rays play a very important role in the treatment. X-rays are to be done every 15 days to see that the bones are lengthened as desired. Once lengthening is achieved, X-rays become more important to study the quality and process of the new bone formation in the created gap. Once the bone formation is complete and becomes strong to bear stress and strain of normal walking, the Ilizarov's Fixator consisting of rings, wires, and the rods, is removed. Hence, X-rays should be done properly on prescribed dates given by the Surgeon.

The 'new bone', which is formed in the created gap, by the process of lengthening, is strong and has same measurement in breadth as the original bone. The bone growth **does not require bone grafting**.

Dressings are done as advised Antibiotics, analgesics, and vitamins are necessary till stitches are removed. It is desirable to cover the whole Fixator with a big clean cloth so that outside dust, fly, mosquitoes do not sit on the wound and make it unclean.

Physiotherapy

Physiotherapy holds a very important place. Patients and their relatives have to be very vigilant about giving physiotherapy to the neighbouring joints. The neighbouring joints have to be moved through the full range of the movement regularly and repeatedly, to keep them flexible. This reduces the chance of development of contractures. Patients are allowed to move about in and out of the house with the help of the Axillary crutches. Weight bearing is not permitted till the new bone formed is strong. Once the formed new bone is strong, in the initial phase, partial weight bearing is allowed which is gradually increased to full weight bearing.

If Contractures do develop, it is corrected during removal of the Fixator or later on.

This technique of ILIZAROV can also be used in other bone and joint conditions, which are as follows:

- 1) Fractures of the bones simple or compound.
- 2) Non-united fractures (here bone grafting is not necessary)
- 3) Correction of badly deformed bones due to
 - a) Mal-union of fractures
 - b) Diseases of bone
- 4) Very bad deformities of the joints.
- 5) Bone gap caused by bone loss due to
 - a) – Injury
 - b) – Infection etc.