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Original

ILIZAROV TECHNIQUE IN CORRECTING LIMBS DEFORMITIES: PRELIMINARY RESULTS

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This is a prospective study of eleven patients treated by Ilizarov technique for various limb lesions. These included lengthening, deformities, malunion, non union and congenital pseudarthrosis. Abundant, well formed new bone was obtained in all patients who had lengthening procedure. Union for pseudarthrosis was sound.

Twenty one manageable complications were encountered in the 15 segments treated, most of the complications could be reduced by improving the surgeons' familiarity of the technique, beside a careful psychological preparation of the patients before and during the treatment.

This method of treatment is very useful for certain cases of musculoskeletal disorders provided familiarity of the technique and pre-operative planning are maintained.

The Ilizarov technique was introduced in Siberia in the 1950 principally to fix trans-osseous tensioned wires over rings which are connected together by rods. If it is used for lengthening or correction of bony deformities, then corticotomy of the segment between the rings is performed. The medulla and periosteum should be preserved[1,2,4].

Ilizarov has demonstrated that bone and soft tissue could reproducibly be formed by gradual distraction. This has led to the management of many congenital and acquired bony problems.

For septic and aseptic non union, Ilizarov has demonstrated that compression, distraction forces through the site of non union can stimulate union without the need for bone grafting[1,2,4].

The objective of this prospective study was to evaluate and compare these results with other published studies elsewhere.

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METHODS

This is a prospective study of eleven patients managed for various limb lesions with the Ilizarov technique at King Khalid University Hospital between December 1992 and May 1994. This represent the initial 17 months of use of this technique. The method used was the classical technique described by Ilizarov[1,2,3]. It is based on transfixation of the limb segment involved by tensioned transosseous 1.5 to 2.0 mm wires. These wires are fixed to a stainless steel ring around the limb. Each ring has to be at least three centimeters away from the skin all around the limb. The rings are connected to

each other by 6.0 mm threaded or telescopic rods (Fig 1). Compression or distraction of bone segments can be controlled by the connecting rods. The distraction rate is 1.0 mm per day for limb lengthening procedures. The new bone formation is observed radiologically (Fig 2). Weight bearing is essential from the early phases of the treatment (Fig 3,4). All the eleven patients were entered into the study. Fifteen segments were treated by this method. Patients with various skeletal deformities where the conventional methods of management had failed were selected for this type of treatment. A complication was considered for any untoward occurrence to the patient. These were managed by intensive physiotherapy and rehabilitation, local pin site care, antibiotics and psychological support for the patients.

RESULTS

Fifteen limb segments were managed by Ilizarov technique. These included 2 femoral, a knee and 12 tibiae (Table 1).

Table 1

Case	Sex/Age (years)	Diagnosis	Limb Segment tested
1	M/13	Malunion + shortening	(L) tibia
2	M/19	Nonunion	(R) tibia
3	M/5	Achondroplasia	(R) & (L) tibia
4	M/13	Old epiphyseal injury distal right femur + Short	(R) femur (R) tibia (R) knee
5	F/5	Congenital pseudoarthrosis	(R) tibia
6	M/30	Infected non-union (L) tibia	(L) tibia
7	M/5	Proximal femoral focal deficiency	(l) femur
8	F/17	Achondroplasia	(R) & (L) tibia
9	M/22	Postpolio shortening (L) Leg by 6 smc	(L) tibia
10	M/5	Congenital pseudoarthrosis	(R) tibia
11	M/30	Infected non-union (R) tibia	(R) tibia

Table 1 contd .....
5th 6th and 7th column

Reason for	Result	Complication

treatment		
200 valgus 3 cm short	Correction of deformity and left tibia lengthening 3 cms	Pin-trac infection
Non-union	Union	Depression, Pin-trac infection, oedema (R) foot
Short stature	Lengthening of both legs by 8 cms.	(R) peroneal nerve palsy, depression, knee and ankle contracture
7 cm short Valgus 500 Sublux (R) knee	Correction of valgus and lengthening of the left femur by 7 cms.	Transient hip and knee contracture, depression
Non-union	Union	--------
Segmental bone defect	Poor regenerate formation	Pin-trac infection, knee and ankle contracture
Lower limb shortening (24 cm)	Lengthening of the left femur by 9 cms	Transient hip-knee contractures
Short stature	Lengthening of both legs by 6 cms	Transient, depression, knee and ankle contracture
Short (L) leg	Lengthening of left leg by 6 cms	------
Non-union	Weak regenerate	(R) peroneal nerve palsy
Infection + non-union	Union	------

There were 9 males and 2 females patients with an age range of 5 to 30 (average 14.9) years old. The duration of follow up ranged from 6 to 17 months. Five (45%) patients had congenital abnormalities of their limbs, and the remaining 6 (55%) were having acquired deformities. The average duration of treatment was from 3 to 5 months.

The purpose of the treatment was lengthening in 5 segments, lengthening and correction of deformity in 5 segments, and treating congenital pseudarthrosis and non union in 5 segments. No bone graft was used in any of these patients.

In the patients who were managed predominantly for limb-length inequality, the average lengthening was 8 (range,3 to 12 cm).

There were 21 complications (Table 1). Joint contracture was the commonest complication encountered during the procedure. Out of 10 joints involved, 8 were successfully managed by intensive physiotherapy plus intermittent distraction during the course of treatment.

Pin-trac infection developed in 4 segments. The pins which showed infection were those passing through thicker soft tissue and staphylococcus aureus was the only organism isolated from all infected segments. It was managed by local pin site care along with administration of oral antibiotics.

Four patients suffered from depression during the course of the treatment. Two developed transient peroneal nerve palsy; and both patients were below the age of six years. Dermatitis occurred in one patient after the use of alcohol as cleaning solution.

None developed persistent or recurrent limb oedema during the treatment. The objective of the treatment was achieved in 14 out of 15 segments treated. One patient with previous severe vascular and soft tissue crush injury did not develop satisfactory regeneration and the procedure was discontinued.

DISCUSSION

The application of the Ilizarov method is relatively new outside Russia[5]. It offers a different approach, with many new options in the treatment of non union and bone deformities. Apart from the standard techniques, such as bone grafting, compression plating, intramedullary nailing and external fixation, the Ilizarov method provides experienced surgeons with more options used for the treatment of relatively difficult musculoskeletal pathological conditions.

The indications for the use of Ilizarov technique in this study were similar to those in Russia by Ilizarov[1] and within the recommendation of ASAMI group[2] in Europe and North America with nearly the same duration of treatment. The complications were more than what is been claimed by the Russians, but it has some similarity with the complications reported by ASAMI group[2].

Unavoidable complications are still observed when performing Ilizarov procedure. Of these complications, joints stiffness and contracture are difficult to manage. It was found more in segments treated by lengthening as been noticed by Velazquez et.al[6]. Subclinical nerve damage has been reported by Galardi et al[7]. In this study, two patients developed transient peroneal nerve palsy which was confirmed by nerve conduction studies. The nerve can be injured during wires insertion or at the time of completion of the corticotomy by rotating the two ends of the segment into opposite directions to break the posterior cortex where traction injury of the nerve is likely to happen.

Depression during the treatment phase can be minimised by thorough psychological preparation before and during the procedure.

CONCLUSION

Satisfactory union and new bone formation were obtained using Ilizarov technique. This method is very useful in cases where conventional methods for skeletal deformities treatment were not successful. Adjustment and care of the fixator is time consuming. Many complications can be avoided by proper pre-operative planning, improving the experience and familiarity of the surgeons with the technique. Most of the complications are manageable.

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