

The Ilizarov Fixator

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External fixators are special frames attached to bone by pins or wires. External fixation devices are used to manage open fractures with soft tissue damage. It provides stability and support for the fracture while it allows active treatment of damaged soft tissue.

The Ilizarov external fixator is a special device using rings, rods, clamp and pins which can be attached to the skeleton to provide stability to that portion of the body. The Ilizarov device is used for correction of angulation and rotational defects, treatment of non union and for limb lengthening. Callus and bone formation is stimulated by prescribed daily adjustment of the telescopic rod.

This method of using the ring fixator and inducing union by distraction and compression osteogenesis was described by Ilizarov. He developed this fixator in Siberia in 1951 and it was 30 years later in 1981 that this system was discovered by the western world and subsequently gained popularity.

Care Study:

Mr. Raju aged 21 years, a mechanic from a middle class family was admitted into CMCH with a history of meeting with a road traffic accident, in which he sustained a grade II compound fracture of the right leg. He was taken for emergency debridement and an uniaxial A.O. external fixator was used till the wound healed. The fixator was then removed and he was put into a patella tendon bearing (PTB) walking cast. Six months post-cast, there was no sign of healing so he underwent an autologous bone marrow graft to the site of delayed union in an attempt to promote

osteogenesis. Nine months after surgery there was still no sign of healing. It had become and established non union. Mr. Raju was subsequently readmitted and he underwent an Ilizarov fixation for his right leg. He was treated by distraction and subsequently compression of the non union. He was taught to adjust the telescoping rods and perform skin care. He was encouraged to walk initially partial weight bearing and subsequently full weight bearing without support. When desired correction had been achieved no additional adjustments were made. After 3 to 4 months the fracture had clinically and radiologically united. The fixator was retained for further two months to protect the repair. The fixator was removed after non union had progressed to union with full return to function. The care demonstrates that even difficult non unions can progress to union with the use of this system.

Etiology and Pathology:

Non union can be classified into viable and non viable. Viable is that which produces callus. Depending on the type of callus response it could be further classified as elephant foot, horse hoof or oligotrophic. Non viable or non callus producing is further sub-classified according to the reason for non viability i.e. Torsionwedge, comminuted, gap or defect and atrophic.

The non union seen in Mr. Raju was of the atrophic type. The cause of the non union was probably due to 2 factors.

1. The tibial blood supply in the distal one fourth is extremely poor and the incidence of non-union is higher when it is situated in this part of the tibia.
2. This was initially a compound injury which may have further rendered the fracture fragments avascular by periosteal stripping at the time of injury.

Other factors which can lead to non union are:

- (i) Inadequate immobilisation.

- (ii) Soft tissue interposition between the fracture fragments.

- (iii) Distraction of the fragments by traction.

- (iv) Infection.

- (v) Segmental fracture involving a segment of bone.

The conventional treatment for an established non union is Open reduction internal fixation and bone grafting.

Mr. Raju was put on the Ilizarov fixator. The non union was distracted then compressed to induce osteogenesis.

Nursing Process:

Assessment:

Health History: Mr. Raju got admitted with the history of inability to walk for the last 9 months, pain and deformity of the right leg following a road traffic accident. Initially he was treated with external fixator for a grade II compound fracture of the right tibia and fibula and subsequent a plaster cast, bone marrow injection followed by further period of plaster immobilization.

Physical examination:

On examination, right leg muscle wasting was present. He has a healed scar over the front of the lower 1/4 of the right leg. Anteromedial angulation of the tibia was present. Tenderness was present at the fracture site. Abnormal mobility could be demonstrated which was associated with pain and loss of transmitted movement.

Ankle joint's Dorsi flexion was 10° (Normal 40°) and Plantar flexion was 25° (Normal 45°) Knee joint was normal Distal neurovascular status was intact.

X-ray right leg showed a fracture of the lower 1/3 of Tibia and Fibula rounding off and sclerosis of the bone ends.

Nursing diagnosis and intervention:

A patient who requires the external fixator faces problems of one kind or another throughout the period of being

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on the fixator. He presents a continuous Nursing challenge.

1. Fear and anxiety related to the Ilizarov device

Objective: Fear and anxiety are reduced.

The apparatus looks complex and is bulky as the fixator has pins, rods and clamps. Mr. Raju was shown the apparatus before it was applied. He was reassured that the discomfort would be minimal and early mobility was anticipated. He was told that apparatus would initially feel heavy but would provide stability once it was attached. It did help him to reduce anxiety.

2. Alteration in comfort related to the fixator

Objective: Comfort is promoted

Most patients complain that objects like clothing get caught and sometimes the opposite limb gets injured by sharp ends of the K-wires of the apparatus. This was avoided by bending the wires in wards and in addition to this the wires were covered by small bits of rubber tubing (cycle valve tube rubber).

3. Injury potential edema related to immobilization

Objective: Edema is prevented.

Raju's leg was elevated post operatively using pillows thereby edema was avoided. Elevation of limb above the level of heart decreases edema and in turn allows early exercise of adjacent joints.

4. Injury potential neurovascular compromise related to the fixator

Objective: He is prevented from neurovascular compromise.

Regular neurovascular assessment i.e. color, movement, temperature and sensation were checked every day. Pedal pulse too was checked.

In the process of distraction or compression there may be stretching of a nerve around a pin which will produce symptoms such as pain or numbness or even motor weakness. Neurovascular status was intact in the affected limb.

5. Mobility impaired physical related to restricted activity secondary to the fixator.

Objective: Mobility is promoted.

Active or passive range of motion for extremities is needed as the condition permits. Mr. Raju was given arm exercise to prepare for crutch walking. He was taught isometric exercise and encouraged to do quadriceps drill. Crutch walking has special problems i.e. carrying the external fixation device around the leg is not convenient. He had to learn to swing through the crutches without catching the ends of the wires. He learnt this very quickly and was then encouraged to put weight on the leg with the fixator within a month, and was weaned off one crutch within two months of the fixator application. In three months time he was walking without crutches, full weight bearing with a slightly-awkward gait so as to allow for clearance of the opposite limb because of the rings of the fixator.

6. Infection actual related to the presence of multiple pins

Objective: Infection at pin site is minimised.

There are numerous K wires passing through the limbs which are required to be kept clean. Prevention of infection is an important concern. He was given pin site care by mechanical cleaning of crust formation, pulling the skin back over the wire and cleaning and dressing with povidon iodine gauze. He was observed for signs of infection at the pin site i.e. redness, pain and tenderness, or any discharge. On two occasions during the course of his treatment he had to have local infiltration of cephazolin around the pins which had developed infection and thus was supplemented by oral antibiotic for one week to control the infection.

7. Coping ineffective individual, family related to prolonged hospitalisation

Objective: He and the family are helped to cope with the situation.

The prolonged duration of treatment, inability to go to work and the limitations caused by the cumbersome

nature of the apparatus caused some degree of anxiety to Raju and his relatives which required extra moral support from time to time.

8. Knowledge deficit related to home care

Objective : He is prepared for home care

Raju was taught how to keep the pin tracts clean and dressed. He also learned the care and cleanliness of the rings and to make sure that all the nuts and rods were secure. He was told about the various aspects of infection and how to recognise signs of a persisting infection. He was also taught how to assess his neurological status, and to continue to move the joints which were left free to prevent contractures.

In conclusion

This is a complex apparatus which requires meticulous Nursing care for a long period of time. But is extremely gratifying as the success rate is high.

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