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MANAGEMENT OF SEGMENTAL DEFECTS BY INTERCALARY BONE TRANSPORT USING NASEER-AWAIS FIXATOR

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ABSTRACT

Ten patients with segmental skeletal defects were managed with Ilizarov is intercalary bone transport method using local Fixator (Naseer-Awais Fixator), where by an osseous defect is eliminated by elongating one fragment. On average, the regenerated new bone length measured 696mm in 10 patients (minimum 40mm - maximum 145mm, Mean 69.6mm, ± 1 SD=31.5) Major complications encountered during this study were shanz screw infection, early consolidation. Technique with results is presented and discussed in this paper.

INTRODUCTION

Ilizarov introduced distraction osteogenesis as a biologic technique for creating new bone in existing local bone. In 1969 he published his work on replacement of defects of long tubular bones by means of one of their segments. With this method missing osseous tissue of any length can be reconstructed without the need for bone grafting. If the defect is large it is possible to transport two fragments of bone towards each other to speed up closure of the defect (Green, SA et al., 1992). NA fixator is applied at three or more levels depending upon the number of fragments to be transported. Authors used this local fixator for the first time during early 1990 for segment transport 3 years after this procedure was practiced for the first time in USA (Green, S. et al. 1992)

and 21 years after this technique was reported by Ilizarov.

The factors important for new bone formation at osteotomy site (within the gap created by transport of the healthy piece of bone) one exactly same to those in limb lengthening. These include: maximum preservation of extra osseous and medullary blood supply; stable external fixation; a delay prior to distraction; a distraction rate of 1mm per day in frequent small steps; a period of stable neutral fixation after lengthening; and physiologic use of elongating limb (Ilizarov, GA., 1990).

Chronic infection of the shaft of long bones is one of the most perplexing dilemmas in orthopaedic surgery to obtain eradication of the infection, bony union and functional extremity in the

past has been difficult and same times has lead to amputations (Cattaneo, R. et al., 1992) the main surgical principal in management of diaphyseal bone infection is complete removal of dead tissues (debridement). This always leads to shortening of bone segment and non-union.

In presence of active infection and loss of local soft tissue cover, it is not possible to perform internal fixation of fracture and add bone grafts. External fixation is method of choice for stabilization of these fractures, and regeneration of the new bone locally without the use of bone grafts.

In chronic infection where sequestrae are resected or in tumour surgery when a segment of bone is excised, corticotomy/osteotomy of proximal or distal residium of that long bone provides a segment of bone which can be transported across the defect leaving behind new bone formation. In this study authors report their experience of treating 10 segmental defects of long bones using NA-Fixator.

MATERIAL AND METHODS

10 patients with segmental defects of femur & tibia were treated by authors. Out of these 10 cases 9 were male and 1 female. In 7 cases there was segmental bone loss because of severe local injury leading to loss of bone pieces and soft tissue. 2 cases had chronic osteomyelitis in the childhood leading to formation of sequestrum of a segment of bone which when excised lead to

segmental defect. 1 case was of recurrent non-ossifying fibroma of upper 1/3 of tibia, which when excised left a segmental defect.

All cases were operated under general anaesthesia and fixation was performed at three level in 9 cases and four level in 1 case. Antibiotics were used sparingly in these cases. In all cases wide 3 pin clamp (3 pc) were fixed at the ends of the threaded rod and 2 pin clamp. (2 pc was fixed in the middle to the segment prepared for transportation (Fig.1 - Fig.2).



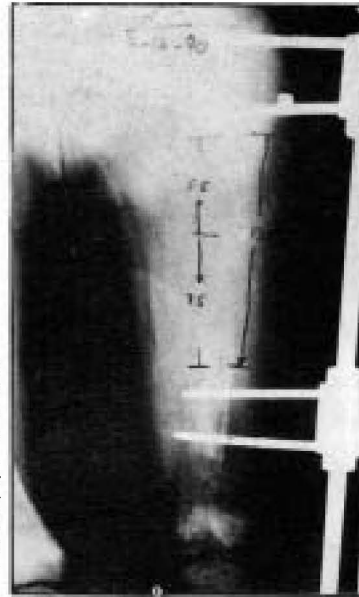
*Fig. 1: (a)
8 Years
Old Girl
with
Segmental
defect of
Femur*

Minimum age of patient in this group was 8 years, maximum 44 years (Mean 24 years). Out of these 10 patients 5 had segmental defect in right limb and 5 had in their left limbs, 7 were tibia and 3 femur bones.

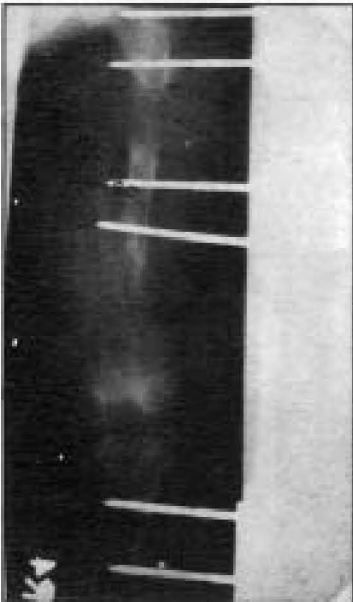
MANAGEMENT OF SEGMENTAL DEFECTS USING N.A FIXATOR



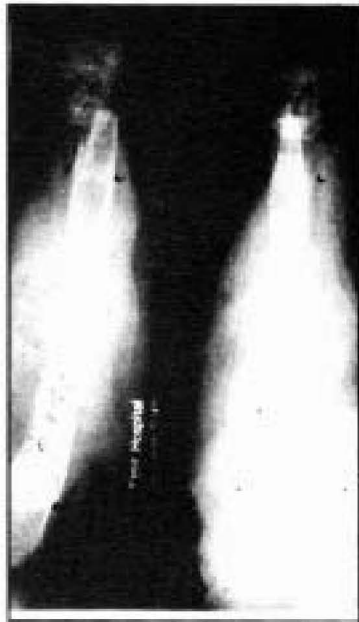
*Fig.1: (b)
Corticancellous
Bone Grafts
have been
absorbed
completely*



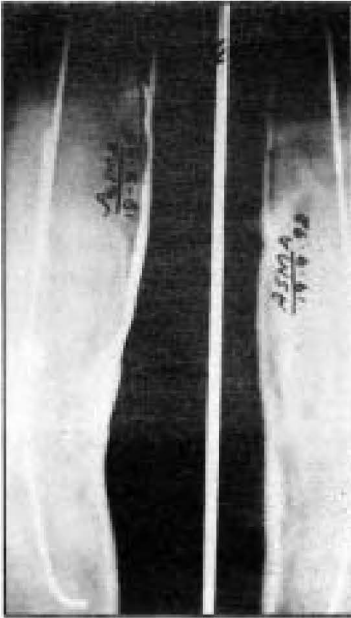
*Fig.1: (d)
Transport
of Segment
of Femur is
complete.
New Bone
is forming
at
Distraction
Gap*



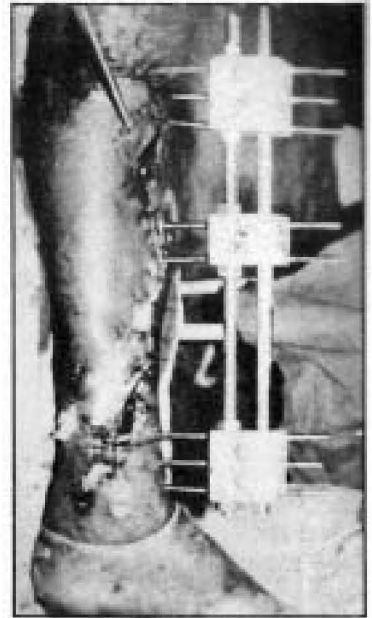
*Fig.1: (c)
Segment of
Bone is
being
Transported*



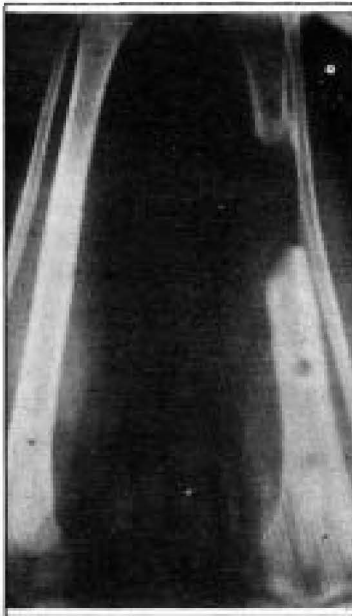
*Fig.1: (e)
A good
quality
Bone has
been
formed*



*Fig.1: (f)
Internal
Fixation and
Bone
Grafting
carried out at
level of
approximation
of two bone
ends*



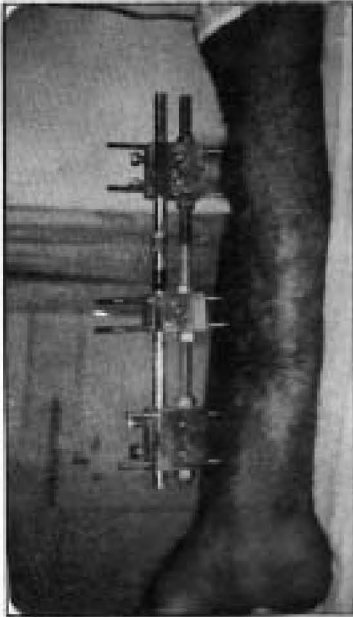
*Fig.2: (b)
Three
level
Fixation
pointer
showing
site of
Osteotomy/
Corticotomy*



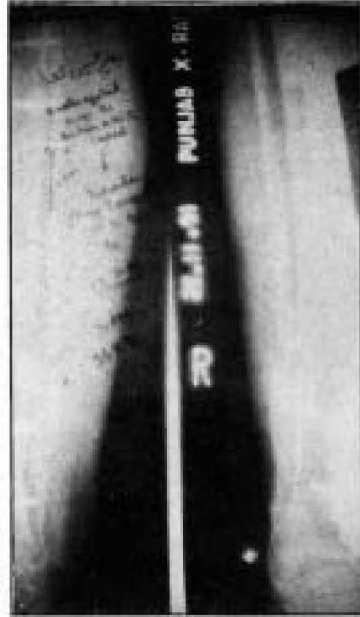
*Fig.2: (a)
X-rays of
Patient in
which
Bone
Segment
was lost
after Road
Traffic
Accident*



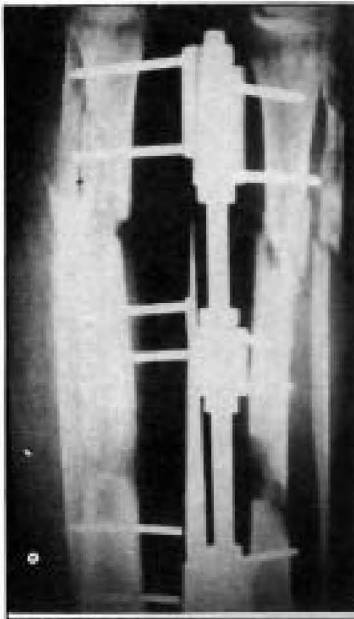
*Fig.2: (c)
X-rays of
Fig 2(b)A*



*Fig.2: (d)
Segment
Transported
Wound
Healed*



*Fig 2: (f)
New bone
formation
complete*



*Fig.2: (e)
Segment
Transported
new bone
forming*

RESULTS

10 cases, 9 male and 1 female were treated using NA-Fixator. Sum of the defectors was 696 (min 40 max. 145 Mean 69.6%) time interval between osteotomy/corticotomy and start of distraction was 9.4 day/patient (min 6, max. 12). Sum of the days of distraction 755 days (min. 45 max. 150 ref 75.5). Speed of segment transport should not be more than 1mm/day. In present study the speed were average 0.92mm. range (0.62 - 1.3mm). The speed of segment transfer was 0.92mm/day (range 0.62-1.3mm/day). In 1 case four level fixation was performed corticotomy was performed at two levels and two segments were transported (Fig. 3). After 25 days of segment transport, pins from

distal segment were removed and for rest of the period transport of only proximal segment was carried out. In 5 out of 10 cases, after the transport was complete, bone grafting at the site where two bone ends approximated was performed.

ing (Table 2) are comparable to the other studies published so far.

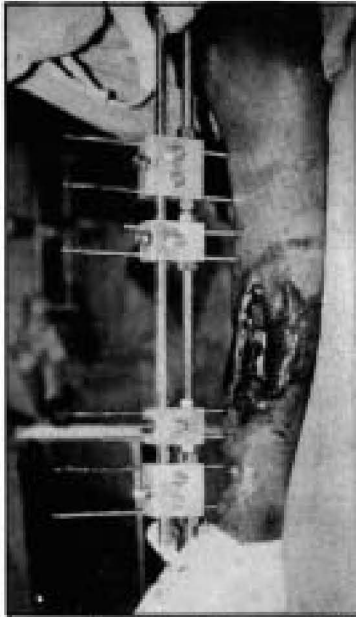


Fig.3: Soft Tissue and Bone (a) Segment Loss in Gun Shot Injury. NA - Fixator Applied at four levels

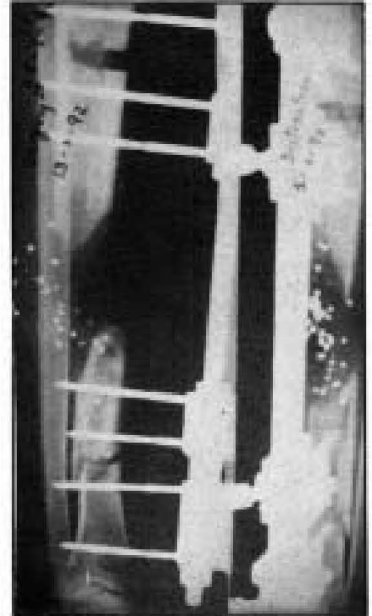


Fig.3: (b) X-rays of 3a

Discussion: Segment transport can be labelled as bone lengthening (reconstruction of missing segment without increasing limb length). In bone lengthening by callus distraction, the bone receives a direct distractional force while the soft tissues are stretched indirectly. Different types of ring external fixators and unilateral external fixators are used for this purpose in different hospitals in the world. NA-Fixator is uniaxial, has few components, developed locally, is cheap and has performed the desired function. Various parameters of bone lengthen-

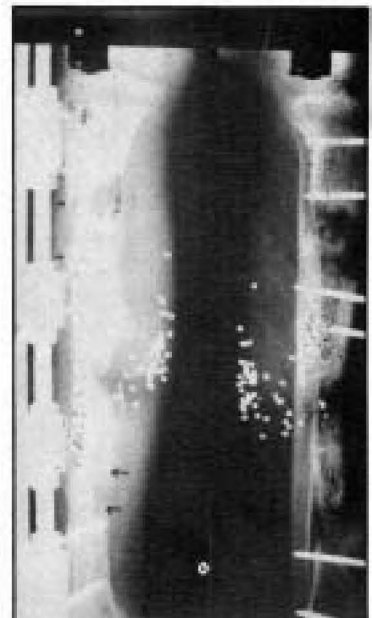


Fig.3: (c) Segment Transport in Progress

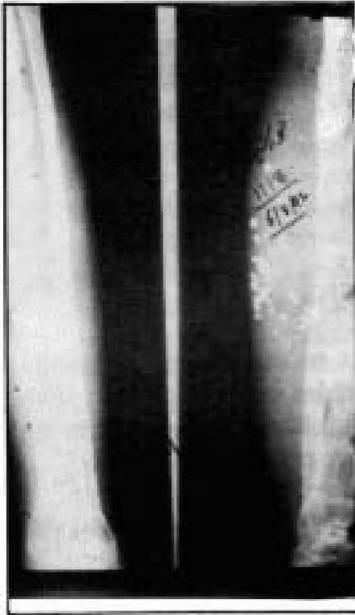


Fig.3: (d) Segment Transport Complete

TABLE 1

LENGTH OF GAP OF SEGMENTAL DEFECT

Bone	No. of Cases	Sum of Length	Minimum	Maximum	Mean	±ISD
Tibia	7	441	40	85	63	19.8
Femur	3	250	40	145	83.3	54.8
Both	10	691	40	145	69	32

TABLE 2

LENGTH ACHIEVED

Bone	No. of Cases	Sum of Length	Minimum	Maximum	Mean	±ISD
Tibia	7	441	40	85	63	19.8
Femur	3	255	45	145	85	52
Both	10	696	40	145	69.6	31.5

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