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A FUNCTIONAL OUTCOME OF DISTRACTION OSTEOGENESIS IN INFECTED NON UNION OF LONG BONES

Orthopaedics

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ABSTRACT

Non union is diagnosed whe either radiological or clinical evidence (or both) prove that healing has ceased and unity is highly unlikely. A non union is defined as a disability that has been present for at least nine months, the broken bone doesn't heal in 3 observable signs of progressive healing. The objective of the study is to access whether unilateral external fixators (dynamic external fixation system and rail fixation system) are an effective method in treatment for infected non- union long bones, which could contribute positively towards understanding their actual use. It is a prospective study conducted over a period of 2 years in department of orthopedics VMKVMCH Salem. The percentage, mean and standard deviation will be calculated for all the parametric variables and statistical inference will be derived by using Chi-square test. The mean age of the patient is 34.33±9.45 years. The higher no. of excellent functional outcome was observed (63.33%) The higher no. of patients was observed in the duration of non-union of 3-6 months and 6.9 months (46.66%) . We recommend promptly refreshing the fracture ends and removing any soft tissue that may be trapped between them at the docking locations in order to facilitate bone union.

KEYWORDS

Non-union, long bone fractures, external fixators, rail fixation system, infected non-union, functional outcome, bone healing

INTRODUCTION

Non union is diagnosed when either radiological or clinical evidence (or both) prove that healing has ceased and unity is highly unlikely. A non union is defined as a disability that has been present for at least nine months, the broken bone doesn't heal in 3 observable signs of progressive healing. While not all long bone fractures behave in this way (a fact that must be conveyed), any claim of non union should wait for at least six months after the event, to account for delay in healing [1, 2].The exact etiology of non union and delayed union remains obscure.

There is considerable controversy with respect to the devices utilizing for non union therapy. For the treatment of Closed Fractures multiple tools are used i.e LRS (Limb Reconstruction System) Intramedullary nails, DCPs/ LCDCPs and Ilizarov external fixator [3, 4]. External fixators have an important role in ensuring that bone remains both biologically viable and retains their biomechanical stability, theses being common denominators for any successful treatment. Among these fractures the ring fixators have yielded better results but they are also very cumbersome and demanding high attention from both patients as well as surgeons that need a sophisticated operative technique [5].

The objective of the study is to access whether unilateral external fixators (dynamic external fixation system and rail fixation system) are an effective method in treatment for infected non- union long bones, which could contribute positively towards understanding their actual use.

MATERIALS AND METHODS

This prospective study was conducted over a period of two years in the Department of Orthopaedics, Vinayaka Missions Kirupananda Variyar Medical College and Hospital, Salem, involving 30 patients with infected nonunion of long bones treated using unilateral external fixators. Patients were selected based on inclusion and exclusion criteria, adopting the AO classification for nonunion of the femur or tibia with draining and non-draining sinuses. All patients underwent thorough wound debridement, removal of previous surgical implants, and stabilization with a Limb Reconstruction System (LRS). A low-energy corticotomy was performed at the healthy metaphyseal end, followed by a latency period of 7–10 days before controlled rhythmic distraction at a rate of 1 mm per day until bone loss was compensated. After docking, patients were kept in a resting phase for six times the distraction period, and union was confirmed before LRS removal. Patients received appropriate wound care, passive physiotherapy, and non-weight-bearing limb support, with antibiotic therapy administered when indicated. Functional outcomes were evaluated based on persistent pain, deformity, joint stiffness, and ability to walk unassisted or with minimal support. Exclusion criteria included patients below 18 years of age, unwillingness for surgery, multiple comorbidities, epiphyseal fractures, septic arthritis, and vascular repair requiring skin grafting. Statistical analysis involved calculating percentages, means, and standard deviations for parametric variables, with statistical inferences derived using the Chi-square test. Study was done after obtaining IEC from institute ethical committee.

RESULTS

The age distribution of the patients showed that the highest number of cases (43.33%) were in the 31–40 years age group, with a mean age of 34.33 ± 9.45 years. Gender distribution revealed a higher proportion of male patients (63.33%) compared to females (36.67%). Regarding the type of infection, discharging infections were most common (70%), while active non-discharging and quiescent non-discharging infections were observed in 10% and 20% of patients, respectively.

The duration of non-union was most commonly between 3–6 months and 6–9 months, each accounting for 46.67% of cases, while only 6.67% of cases had a duration of more than nine months. Similarly, union time followed the same trend, with the majority of patients achieving union within 3–6 months and 6–9 months (46.67% each), whereas only 6.67% took longer than nine months to achieve union. Patient follow-up was predominantly between 11–15 months (50%), with fewer patients followed up for less than 10 months (16.67%).

Limb shortening was most commonly observed at 2 cm (23.33%), followed by 1 cm (16.67%), while shortening of less than 1 cm was rare (3.33%). The site of infection was predominantly in the tibia (43.33%), followed by the femur (40%), with the humerus being the least affected site (16.67%). Analysis of previous treatments showed that the majority of patients had undergone IL nailing (36.67%) or traditional native treatment (33.33%), while plating (20%) and POP (6.67%) were less common.

Among plastic procedures performed, skin grafting was done in 10% of cases, and SSG flaps in 13.33%. The most common bony procedure was metal exit with debridement and fixator application with distraction-compression (36.67%), followed by debridement with fixator application and compression (23.33%). Fewer patients underwent debridement, fixator application with compression-

distraction osteosynthesis (3.33%).

Corticotomy duration was highest between 40–45 days (23.33%), with fewer patients undergoing corticotomy beyond 50 days. The majority of patients gained a length of 3–4 cm (23.33%), followed by 4–5 cm (13.33%). Complications were minimal, with pin tract infections being the most common (20%), while equinus and wound dehiscence were observed in 6.67% of cases.

Bony outcome evaluation showed that an excellent outcome was achieved in 66.67% of cases, while 20% had good outcomes. Fair outcomes were observed in 10% of cases, and only 3.33% had a poor outcome.

Table – 1 Bony Outcome Of The Patients And Their Percentages

BONY OUTCOME	NUMBER	%
EXCELLENT	20	66.67
GOOD	6	20.00
FAIR	3	10.00
POOR	1	3.33

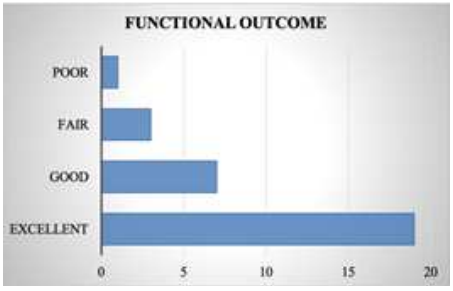

Figure 1 Comparison of the functional outcome of the patients and their percentages

- **Tyre Rubber In Concrete And Mortars**

Research on cement-based products modified with Tyre rubber – such as concrete and mortar – has been carried out for many years in order to examine the potential utilisation of waste Tyres in concrete production. Waste Tyres have been used to partially replace the aggregates in mortars and concrete. Tyre rubber can be used to produce workable concrete for specific applications, provided that adequate selection processes are undertaken – including the amount, gradation and shape of Tyre particles. This section deals with the properties of either mortar or concrete modified with waste Tyre rubber.

DISCUSSION :

Bony outcome and functional outcome of patients were graded as excellent, good, fair and poor. In bony outcome, 66.67% have excellent outcome, 20% have good outcome, 10% have fair outcome and 3.33% have poor outcome. This result was comparable with many studies. In maini et al[6]., study 70% have excellent outcome, 10% have good outcome, 0% have fair outcome and 20% have poor outcome. In Chaddha et al[6]., study 52% have excellent outcome, 4% have good outcome, 0% have fair outcome and 44% have poor outcome. In Yin et al., study 67% have excellent outcome, 23% have good outcome, 7% have fair outcome and 3% have poor outcome. In patil et al[7]., study 41% have excellent outcome, 34% have good outcome, 10% have fair outcome and 15% have poor outcome. In Farmanullah et al[8]., study 57% have excellent outcome, 21% have good outcome, 14% have fair outcome and 8% have poor outcome.

CONCLUSIONS

Rail fixator systems effectively promote bone union in large bone defects that are infected, while also aiding in the treatment of infection, reducing shortening, and managing bone and soft tissue loss simultaneously. We recommend promptly refreshing the fracture ends and removing any soft tissue that may be trapped between them at the docking locations in order to facilitate bone union. This eliminates the necessity for bone grafting. The transporting fragment displaces the overlying skin during distraction, eliminating the necessity for flap or skin grafting. Superficial pin tract infection, wound dehiscence, and equinus frequently occur with the treatment of long bone defects. However, the majority of patients can attain good to excellent functional outcomes.

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