



Orthopaedics

A PROSPECTIVE COMPARATIVE STUDY TO EVALUATE FUNCTIONAL OUTCOME IN ANKLE SPRAIN INJURY GRADE I AND GRADE II WITH PARTIAL AND COMPLETE IMMOBILIZATION METHODS

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| Dr. Ravi Diwakar | PG resident of department of orthopaedics NSCB Mch Jabalpur |
| Dr.L.S.Maravi* | Professor, Dep. Of orthopaedics, NSCB Mch Jabalpur *Corresponding Author |
| Dr.S.M.G. Raza | Associated Professor Dep. Of orthopaedics, NSCB Mch Jabalpur |
| Dr.Ashoka vidhyarthi | Professor and head Dep. Of orthopaedics, NSCB Mch Jabalpur |

ABSTRACT **Background:** Acute ankle injuries are one of the most common injuries in orthopaedic department. However, there is still lack of standardized evidence-based treatment. Therefore, the aim of our study was to compare and evaluate the functional outcome of Partial And Complete Immobilization Methods. **Objective:** Comparative evaluation of Functional outcome in ankle sprain patient treated with partial and complete immobilization and to identify factors affecting the functional outcome in patients with ankle sprain. **Materials and Methods:** Methodology- A prospective comparative study was designed from 1st jan 21 to 30th oct 21 49 patients from orthopedic OPD was selected whom were presented with the ankle sprain and ready to give consent irrespective of their gender. Lower Extremity Functional Scale(LEFS) and visual analogue scale (VAS) were observed at pre-treatment and post treatment at 1st ,3rd and 6th week were compared in both category. **Result-** in the present study 35 patients were treated with partial immobilization method and 14 were treated with complete immobilization. Most of patients were belong to age group of 18-25. 67.3 % patients were male and 32.7% were female. 51% having left side injury while 49% have right side a Lower Extremity Functional Scale(LEFS) and visual analogue scale (VAS) were observed at pretreatment post treatment at 1st ,3rd and 6th week. **Conclusion-** - From our prospective study, we conclude that conservative management of ankle ligament injuries (grade I, II) is a safe and effective method of treatment. And partial immobilization is better than the complete mobilization.

KEYWORDS : LEFS, VAS, Ankle Injury , sports persons

Introduction- Ankle injury is one among the most prevalent musculoskeletal injuries. An ankle sprain is the most common lower limb injury among physically active individuals. every day , a study done by polzer et al in year 2012 suggest almost one ankle sprain occurs per 10000 persons in western countries and more than two million ankle sprains are treated annually in emergency departments of the US and UK.¹

Furthermore, the prevalence of under-diagnosed injuries associated with an ankle sprain, in sport, the incidence is even higher, accounting for 16%-40% of all sport-related trauma cases,^{2,3,4} Approximately 40% of all traumatic ankle injuries and nearly half all-ankle sprains occur during athletic activity, with basketball (41.1%), field game (9.3%), and soccer (7.9%) having the most effective incidence.^{5,6,7}

Ankle sprain is more prevalent in females, children, and athletes collaborating in indoor and court sports. Besides the bony and muscular structures, several ligaments have a significant contribution to the stability of the articulation plan, which is distributed in lateral, medial, and syndesmotic areas. Almost 85% of ankle sprains involve the lateral ligaments. In about 65% of cases, isolated injury of the anterior talofibular ligament (ATFL) and in 20%, injury of both ATFL and also the calcaneofibular ligament exist. Injuries of the posterior talofibular ligament are unusual⁸. The remaining 15% involves syndesmotic and medial ankle sprains⁹.

Asyndesmotic ankle sprain is an injury to a minimum of one or more of the ligaments comprising the distal tibiofibular junction and is commonly called "high ankle sprain"¹⁰. Despite its excessive prevalence, the long-term prognosis of an acute ankle sprain isn't favourable and a high proportion of patients experience persistent residual symptoms (up like tendinous and osteochondral injuries and midfoot fractures are high¹¹. Therefore, direct and indirect financial and societal costs for managing lateral ankle sprains and their sequela cause a high socioeconomic burden^{12,13}.

Aetiology and classification- Ankle sprains are mostly the results of harm to Lateral ligament Complex, including ATFL, CFL, PTFL. The ankle sprain occurs chiefly in inversion, foot internal twisting, and plantar flexion, associated with adduction of the ankle.

Many ankle sprains occur when the foot is in systematic loading and unloading¹⁴. Mechanically, the ATFL is injured due to forced

supination in plantar flexion movement and so the CFL is injured when the foot is in dorsiflexion¹⁵. A sprain is characterized by inversion and adduction (internal twisting) whilst the tibia-talar joint is in plantar flexion. Conversely, forced supination merely results in a subtler sprain¹⁶. The occurrence of combined rupture of the ATFL and CFL is reported as 20%, and also the PTFL injury doesn't occur unless the articulation talocrural is undergoes dislocation¹⁷. A hyper dorsiflexion trauma might cause damage to the syndesmosis and an eversion injury will cause injury to the deltoid ligaments¹⁸.

Materials and Methods- This Prospective comparative study was conducted over a period of one years in a tertiary care hospital of India . A total of 49 patients presenting consecutively within 24 hours of sustaining a moderate or severe lateral ligament sprain after an ankle inversion injury were randomized into two equal groups. For the purpose of this study, the terms moderate, and severe were used corresponding to grades I, and II respectively. Fracture was excluded by x ray examination. Only adults were recruited After informed written consent was obtained, each patient was allocated to use either a Partial Immobilization and Complete immobilization. A standard performa for all patients was completed detailing age, sex, time to presentation, occupation, left or right ankle injured, previous injury, ankle girth. All patients included in the study were given a standardized advice sheet referring to the principles of RICE (rest, ice, compression, and elevation) for use after an acute soft tissue injury. Analgesia and crutches were given as required. Review arrangements were made for 1st week, 3rd week, and 6th week at orthopaedics OPD.

Result – In the present study 40.8 % of the patient were belong to age group 18-25years followed by 25-35 years 28.6%. Preponderance of male gender is present i.e. 67.3% female were only 32.7%. 51% have injury on left side and 49% on right side, 65.3 % of the participant have fair built followed by obese i.e. 16.3% , 65.3% were injured by inversion of the ankle joint and 10.2 % cases were by "Inversion And Adduction " and "Inversion And Planter flexion" each. Highest no. of cases was injured during walking i.e.26.5% followed by playing i.e. 22.4% (Table-1). Among all participant 57.1 % were having grade II injury and 42.9% were having Grade I. 71.4 % cases were treated with partial immobilization among them 25 were male and 10 were female and 28.6% patient were treated with complete immobilization among them 8 were male and 6 were female. 4 type of immobilization method were used anklets (30.6) BK Cast(28.6), adhesive bandage (22.4) and crepe bandage (18.4). Time for rehabilitation was different for patient

according to need is different range from 3 week to 6 week, most of patient i.e. 44.8 % were rehabilitated for 4 week followed by 34.6% for 5 week, followed by 14.2 % 3 week and 6.1 % 6 week (Table-2, Fig-1). The mean of LEFS observed pretreatment was 26.75 ±8.92 and at 1st, 3rd and 6th week was 46.61 ± 9.87, 62± 6.31 and 71.7±4.8 respectively which is statistically highly significant. The Means of VAS pretreatment was 7.36 ±1.11 and at 1st, 3rd and 6th week was 4.85±1.38, 2.408±1.337 and .571±0.707 respectively which is also statistically significant. The mean of LEFS observed in partially immobilized patient at 1st, 3rd and 6th week was 51.62±6.06, 64.82±3.8, and 74.1±2.7 respectively. And for completely immobilized patients at 1st, 3rd and 6th week was 34.07±5.1, 54.9±5.8 and 65.8±3.7 respectively which is statistically highly significant for each compared week (Table-3, Fig-2).

Discussion-

Our study the mean of LEFS and VAS scale were compared for Pretreatment and post treatment & for partial and complete immobilization patient at 1st, 3rd and 6th week. The mean of LEFS observed pretreatment was 26.75 ±8.92 and at 1st, 3rd and 6th week was 46.61 ± 9.87, 62± 6.31 and 71.7±4.8 respectively which is statistically highly significant. The Mean of VAS pretreatment was 7.36±1.11 and at 1st, 3rd and 6th week were 4.85±1.38, 2.408±1.337 and .571±0.707 respectively which is also statistically significant. The mean of LEFS observed in partially immobilized patient at 1st, 3rd and 6th week was 51.62±6.06, 64.82±3.8, and 74.1±2.7 respectively. And for completely immobilized patients at 1st, 3rd and 6th week was 34.07±5.1, 54.9±5.8 and 65.8±3.7 respectively which is statistically highly significant for each compared week.

Our findings were comparable with another study done by Saurabh P.Mehta et al⁷⁴, Susan Shultz and Amanda Olszewski et al²⁰, Chris M Bleakley et al.²¹

In our study, most of the patients in a total number of cases of ankle ligament injury sustained grade II ligament tore diagnosed by ultrasonography which was acute onset with fair nourish status, sustained an injury during walking on even surface, and during plying activity. Most of the patients sustained the injury during inversion of the ankle (65. 3%) which was the most common pattern of injury in ankle ligament tore. Anterior tibiofibular ligament (ATFL) was the most common ligament injured during inversion of ankle joint during sustained significant trauma. This was consistent with other studies done by A. Richard Marder²², I.Shrier et al²³, Renström Scott H.F.A. et al²⁴, Pijnenburg C.A. Van Dijk N.C. et.al²⁵, Kerkhoffs J.M.M.G Handoll G.H.H. et al²⁶, Jones.Morgan.H. Amendola et al²⁷, Hertel Jay Chinn Lisa²⁸, Hans Polzer, Karl Georg Kanz, et al²⁹, Gino M Kerkhoffs, Michel van den Bekerom et al³⁰, Cailbhe Doherty, Eamonn Delahun³¹.

Conclusion-

From our prospective study, we conclude that conservative management of ankle ligament injuries (grade I, II) is a safe and effective method of treatment. The results obtained in this study suggest that the use of a brace and taping (adhesive and crepe bandage) as a functional immobilization in the treatment of ankle ligament tear, presenting within 24 hours of injury, produces a significant improvement in ankle joint function, at third and fourth week, compared with standard management with Below knee cast. There is also significant less pain, and swelling (ankle girth) in patient's treated with brace and taping.

Table 1 Age and Sex wise distribution of patients

| Age Group | Frequency | Percent |
|------------------|-----------|---------|
| 18-25 | 20 | 40.8 |
| 25-35 | 14 | 28.6 |
| 35-45 | 6 | 12.2 |
| 45-55 | 4 | 8.2 |
| 55-65 | 5 | 10.2 |
| Sex | | |
| Male | 33 | 67.3 |
| Female | 16 | 32.7 |
| Side Of Injury | | |
| Left | 25 | 51 |
| Right | 24 | 49 |
| Built Of Patient | | |
| Emaciated | 6 | 12.2 |
| Fair | 32 | 65.3 |

| PATTERN OF INJURY | Obese | 8 | 16.3 |
|----------------------|--------------------------------|-------------------------|------|
| PATTERN OF INJURY | Dorsiflexion | 1 | 2.0 |
| | Eversion | 2 | 4.1 |
| | Inversion | 32 | 65.3 |
| | Inversion And Adduction | 5 | 10.2 |
| | Inversion And Dorsiflexion | 1 | 2.0 |
| | Inversion And Planterflexion | 5 | 10.2 |
| | Planter Flexion With Adduction | 1 | 2.0 |
| | MECHANIS M OF INJURY | During Jogging/ Running | 8 |
| MECHANIS M OF INJURY | Playing | 11 | 22.4 |
| | Walking | 13 | 26.5 |
| | Walking on uneven surface | 8 | 16.3 |
| | Fall From Height | 6 | 12.2 |
| | Road Traffic Accident | 3 | 6.1 |

Table 2

| Particulars | No. of participants | Percentage | |
|-------------------------|---------------------|-------------|------|
| Grade Of Injury | I | 21 | 42.9 |
| | II | 28 | 57.1 |
| Type Of Immobilization | Complete | 14(8M+6F) | 28.6 |
| | Partial | 35(25M+10F) | 71.4 |
| Immobilization Method | Adhesive bandage | 11 | 22.4 |
| | Anklet | 15 | 30.6 |
| | Bk cast | 14 | 28.6 |
| | Crepebandage | 9 | 18.4 |
| Time for rehabilitation | 3week | 7 | 14.2 |
| | 4 week | 22 | 44.8 |
| | 5 week | 17 | 34.6 |
| | 6 week | 3 | 6.1 |

Table 3 Outcome of the patient

| Assessment method | Pre-Treatment | Post Treatment | | t- Value | p- Value |
|-------------------|---------------|----------------------|--------------|----------|----------|
| LEFS | 26.75 ±8.92 | 1 st Week | 46.61 ± 9.87 | 28.52 | 0.001 |
| | | 3 rd Week | 62± 6.31 | 38.04 | 0.001 |
| | | 6 th Week | 71.7±4.8 | 48.77 | 0.001 |
| VAS | 7.36 ±1.11 | 1 st Week | 4.85±1.38 | 21.439 | 0.001 |
| | | 3 rd Week | 2.408±1.337 | 36.292 | 0.001 |
| | | 6 th Week | .571±0.707 | 49.71 | 0.001 |

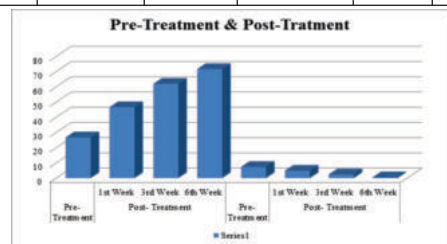
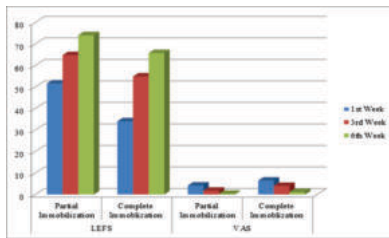


Table 4 Outcome of the patient according to type of immobilization

| Assessment method | Partial Immobilization | Complete Immobilization | t- Value | p- Value | |
|-------------------|------------------------|-------------------------|-----------|----------|--------|
| LEFS | 1 st Week | 51.62±6.06 | 34.07±5.1 | 9.5516 | 0.0001 |
| | 3 rd Week | 64.82±3.8 | 54.9±5.8 | 7.0586 | 0.0001 |
| | 6 th Week | 74.1±2.7 | 65.8±3.7 | 8.7198 | 0.0001 |
| VAS | 1 st Week | 4.2±0.9 | 6.5±0.7 | 8.5627 | 0.0001 |

| | | | | |
|----------------------|-----------|----------|--------|--------|
| 3 rd Week | 1.771±0.6 | 4±1.24 | 8.5121 | 0.0001 |
| 6 th Week | 0.343±0.4 | 1.14±0.8 | 4.6580 | 0.0001 |

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