

Effect of Therapeutic Ultrasound v/s Laser on Functional Performance in Patients with Acute Ankle Sprain

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ABSTRACT

Background: An ankle sprain is where one or more of the ligaments of the ankle are partially or completely torn. An ankle sprain is a common injury. Inversion-type, lateral ligament injuries represent approximately 85% of ankle sprain. The incident of ankle sprain is highest in sports population. Poor rehabilitation after an initial sprain increases the chances of this injury recurrence.

Objective: To find out the effect of ultrasound and laser on functional performance in patients with acute ankle sprain.

Materials and methodology: Total number of 38 both genders males and females participants between the age 18-35 years with ankle sprain patients were selected by customized sampling. Scoring scale for subjective and functional follow-up evaluation after ankle injury was used to assess pain in ankle sprain patients.

Results: After comparing pre and post intervention data using paired and unpaired t test results showed, there was significant improvement in pain ($p < 0.0001$) in Group A.

Conclusion: In this study we concluded that therapeutic ultrasound is more effective than LASER in ankle sprain patients.

Keywords: Ankle sprain patients, Therapeutic ultrasound, LASER, functional performance scoring.

INTRODUCTION:

Ankle sprains are one of the most common musculoskeletal injuries. The most common mechanism is combination of inversion and adduction of the foot in plantar flexion (supination). This injury mechanism can cause damage to the lateral ankle ligaments. Injury of the anterior talo-fibular ligament with intact medial ligaments leads to antero lateral rotator instability. [1]

Ankle ligament sprains are usually graded on the basis of severity. Grade 1 (mild) stretching of ligaments, grade 2 (moderate) is a partial rupture of ligament,

grade 3 (severe) is a complete ligament rupture. The symptoms of ankle sprain include chronic pain, recurrent swelling in chronic instability. [1]

The following are some of the terms used to describe different forces the ankle may be subjected to: Inversion (adduction): Inward twisting of the ankle, eversion (abduction): Outward twisting of ankle Supination Inversion plus adduction of the foot so that the sole faces medially, Pronation Eversion and abduction of the foot so that the sole faces laterally, Rotation (external or internal): A rotator movement of the foot so that the talus is subjected to a

rotatory force along its vertical axis, Vertical compression: A force along long axis of the tibia. [2]

Many treatment options have been suggested like surgery, immobilization, functional treatment with bandages tape or different braces. [1]

Ultrasound is commonly used in association with other forms of treatment in the management of sprains of the lateral ligament of the ankle. Despite its wide spread use there is little scientific evidence to supports its role in the management of ankle sprain. [3] Ultrasound is used in physical therapy to relief pain, reduced swelling and improved joint instability in ankle sprain. [4]

Treatment of painful disorder with LASER is still considered to be experimental by main stream medicine. LASER has three basic effects (biostimulative-regenerative, analgesic and anti-inflammatory effect). [4]

MATERIALS AND METHODS

Material

Demographic data sheet, consent form, therapeutic ultrasound, Laser.

Method

A pre-post experimental study was conducted where in 38 ankle sprain patients were selected according to inclusion an exclusion criteria using customized sampling. The study duration was of 6 months and study setting was hospitals in and around Pune. The target population was ankle sprain patients. Synopsis was submitted to Institutional Ethical clearance to Tilak Maharashtra Vidyapeeth, Department of Physiotherapy. Patients with ankle sprain were approached and 38 samples were customized. Informed were

consent was taken and subjects explained the aim and objectives of the study. Demographic data is obtained by using data collection sheet. The subjects were instructed to fill out the scoring scale for functional follow-up evaluation after ankle injury. Group A subjects received treatment with therapeutic Ultrasound and Group B received treatment with LASER. Assessment was done on 1st and 7th day pre and post treatment.

Ultrasound: [6] Mode- Pulsed

Frequency- 3 MHz

Intensity- 0.1 to 0.5 or 0.8 wcm⁻²

Duration- 8 min

LASER: [6] Device- 904nm

Peak power- 25 watt

Frequency- 5000 or 500 Hz

Energy density- 4-10J/cm²

Pulse duration- 200nsec

For 7 days.

Inclusion Criteria

1. Both males and females.
2. Patients within 18-35 years of age.
3. Medically diagnosed with ankle sprain.
4. Patients with grade I, II ankle inversion sprain.

Exclusion Criteria

1. Any recent fracture to lower limbs in past months.
2. Patients not willing to participate.

Outcome Measures

Scoring scale for subjective and functional follow-up evaluation after ankle injury. [7]

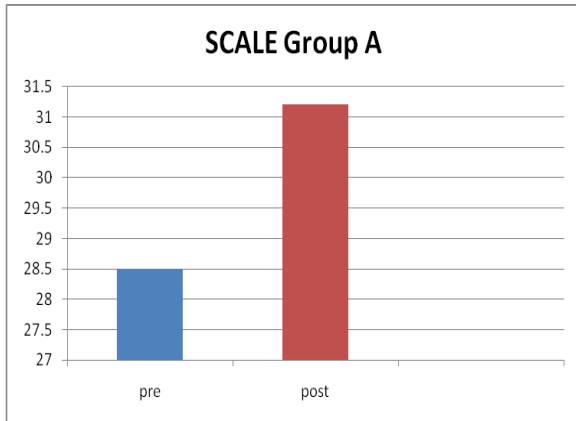
STATISTICAL ANALYSIS:

Microsoft office excel 2007 was used and statistical analysis was done by Instat. Paired and unpaired t test was used for normalised data with p<0.0001. Mean Age was found to be 24.99.

RESULTS

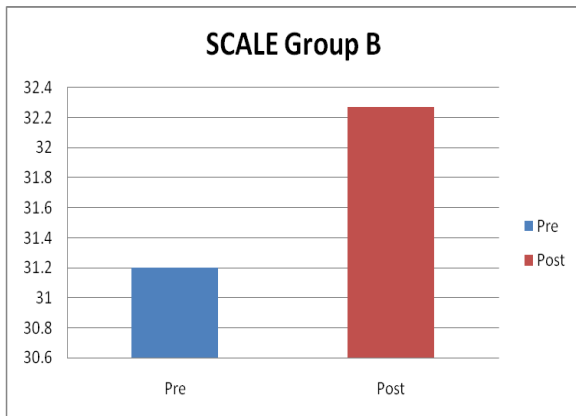
Table 1: Comparison of Variables in Group A & Group B.

Outcome Measures	Group A (Mean ± SD)			Group B (Mean ± SD)		
Age	22.86±4.03			27.13±4.59		
Gender	M=6 F=9			M=5 F=10		
Scoring scale for subjective and functional follow up evaluation after ankle injury	Pre	Post	P value	Pre	Post	P value
	28.53±4.67	60.8±6.92	<0.0001	31.2±5.83	32.26±7.12	0.067



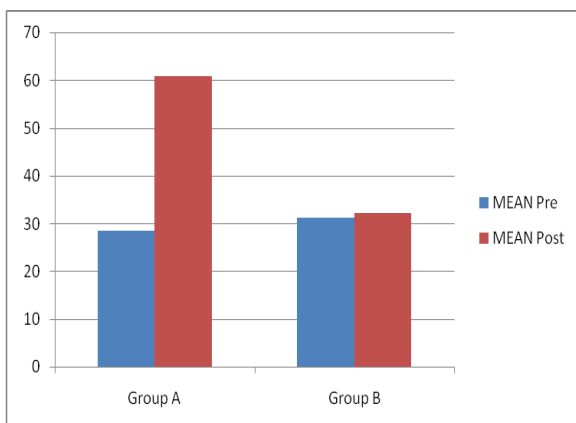
Graph 1: Group A Intergroup comparison of subjective and functional follow up evaluation after ankle injury

Interpretation: This graph describes the pre and post intervention mean values of Scoring Scale for subjective and Functional Follow up evaluation after ankle Injury, for Group A (ULTRASOUND) and shows significant improvement.



Graph 2: Group B Intergroup comparison of subjective and functional follow up evaluation after ankle injury

Interpretation: This graph describes the pre and post intervention mean values of Scoring Scale for subjective and Functional Follow up evaluation after ankle Injury, for Group B (LASER) and shows significant improvement.



Graph 3: Intergroup comparison of subjective and functional follow up evaluation after ankle injury

Interpretation: This graph describes the comparison of pre and post intervention mean values of Scoring Scale for subjective and Functional Follow up evaluation after ankle Injury, for Group A (ULTRASOUND) and Group B (LASER) and shows significant improvement.

DISCUSSION

The purpose of the study was to compare effect of ultrasound versus laser in ankle sprain. In this study 38 medially diagnosed patients were approached out of which 4 participants were excluded according to the inclusion and exclusion criteria and 4 patients dropped out of the study. Group A and group B were divided, Group A was of Therapeutic ultrasound and Group B was of LASER. Assessment was done on 1st and 7th day pre and post treatment. Scoring Scale for Subjective and Functional Follow-up Evaluation after ankle injury was taken as outcome measure in which there were nine components present. Grading system was based on four categories (excellent, 85-100; good, 70-80; fair, 55-65; and poor, <50.) Pain, swelling, stiffness, tenderness, or giving way during activity (mild only one of these symptoms is present; severe, four or more of these symptoms are present).

It is generally agreed that majority of acute grade 1 to 3 ankle sprains can be treated by non-operative measures. During the proliferation phase, the tissue responds with vascular ingrowth, fibroblast proliferation and new collagen formation. Protection of inversion is important during this phase of healing to prevent excess formation of weaker type III collagen formation that can contribute to chronic elongation of the ligament. Controlled stress on the ligament will promote proper collagen fibre orientation. In addition, motion, stretching and strengthening will avoid the harmful effects of immobilization on the muscle, joint cartilage and bone. [1]

A study done by Daniele AWM Van der Windt et al stated that application of therapeutic ultrasound for ankle sprain

results in promotion of cellular metabolic rate and increased viscoelastic properties. [3]

Another study done by Debie et al stated that neither high nor low dose LASER therapy is effective in the treatment of Lat. Ankle sprains. [8]

One study done by Makuloluwe 1977, which compared the effectiveness of therapeutic ultrasound with immobilization in patients with mild to moderate ankle sprain and detected large and significant differences in favour of ultrasound therapy when compared with immobilization using elastoplast. However, this study was considered to be of relatively poor validity and at high risk of bias from lack of blinding. Another pragmatic study comparing ultrasound with electrotherapy reported better results for electrotherapy with respect to improvements of swelling, pain, and ability to walk Van Lelieveld 1979. None of the trials included a follow-up period longer than one month. Ultrasound therapy is assumed to be most effective in the first phase of treatment (Roebroek 1998) and long-term effects may not be expected. Indeed as already stated, the four trials with follow-up periods of two to four weeks showed that the large majority of participants had fully recovered by that time and any difference between intervention groups were negligible. [3]

In 1998 Roebroek, did a study which stated that Ultrasound therapy is

assumed to be most effective in the first phase treatment. [3]

CONCLUSION

Our study concluded that Ultrasound has a greater effect on Ankle sprain than LASER.

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