EFFECT OF EARLY CONTROLLED MOBILIZATION WITH FIBERGLASS CAST VERSUS CREPE BANDAGE WITH TAPING IN LATERAL ANKLE SPRAIN

Imam Md. Akshaful
Post Graduate Student, MPT Orthopaedics, Lovely Professional University, Jalandhar, India.

ABSTRACT

Objective: The ankle sprain is the most common type of sports injury. Conventionally acute ankle sprains are treated with controlled mobilization by using external support such as crepe bandage and taping. Fiberglass cast is a new material that provides better control mobilization. Hence, the purpose of this study is to compare between effectiveness of fiberglass cast over the crepe bandage and taping.

Materials and Methods: Thirty two participants (both male and female) with grade I and II lateral ankle sprain, with mean age of 20.94 years were included in the study based on inclusion and exclusion criteria, and were randomly assigned into two groups (group-A and group-B; n=16). Participants in group-A received fiberglass casting whereas participants in group-B received crepe bandage with taping for 7 days each. Pain, range of motion (ROM), and foot ankle disability index (FADI) were measured in both pre and post intervention.

Results: The findings of this study showed that pain, ROM, and FADI considerably improved in both the groups; however, there was a significant improvement in the group that was treated with fiberglass cast.

Conclusion: Two layers of fiberglass cast showed better result than crepe bandage with taping. In conclusion fiberglass cast can be integrated as a secure method of treatment in addition to conservative management of acute lateral ankle sprain.

Keywords: Controlled mobilization, Fiberglass cast, Sprain, Crepe bandage, Taping, Disability.

INTRODUCTION

Ankle sprain is the most common injuries among all ligament injuries in sports and physical activity. The most common acute injury is a lateral ankle or inversion injury1. Inadequate treatment of ankle sprains can lead to chronic problems such as decreased range of motion, pain, and joint instability2. It is estimated that in western countries, one inversion injury of the ankle occur per 10,000 persons in western countries, resulting in an estimated 23,000 sprains per day3, 1 in 320 or 0.31% or 8,50,000 people in USA annually, 3.32 million per year in India, and 4,41,688 per year in Bangladesh (NIAMS)4. It has been estimated that ankle sprains compose approximately one quarter of all musculoskeletal injuries5. The incidence of ankle sprain is higher in sport6. Sixteen to twenty one percent of all sports linked injuries are ankle sprains7. Seventy sports were analyzed to identify the most often involved joint in sports and they identified ankle joint as the most injured in most studies (24 sports, 34.3%), followed by 14 sports 20.0%, 8 sports 11.4%, 6 sports 8.6% and 6 sports 8.6% for knee, head, trunk, hand respectively. In the study they also...
suggest that ankle injury occurred most commonly i.e 80.0% in aero ball, 60.0% in wall climbing, 45.6% in indoor volleyball, 40.0% in mountaineering, 39.8% in netball, and 39.2% field events in track and field. In about 65% inaccessible injury of the anterior talofibular ligament (ATFL), in about 20% both the ATFL and the calcaneofibular ligament (CFL) are involved. Injuries of the posterior talofibular ligament (PTFL) are rare and only caused by severe dislocation of the ankle joint. The cast is one of the most preferred non-surgical methods of immobilization of an injured extremity by a fracture, dislocation or soft tissue injury. Generally, a cast is made of one of two materials, plaster of Paris or fiberglass. Fiberglass is preferred due to its lighter weight and superior durability. Usually the patient with ankle sprain is immobilized using crepe bandage and/or tapping or POP. Many research works has been done over ankle sprain on crepe bandage, tapping and POP; however, there is no study that uses the fiberglass cast to treat the ankle sprain. Therefore the purpose of this study is to find out the effect of fiberglass cast over crepe bandage with tapping in the treatment of ankle sprain.

**MATERIALS AND METHODS**

32 participants (16 males and 16 females) with the mean age of 20.94 years grade-1 and 2 acute lateral ankle sprain were included in the study. The University Research Ethical Committee approved the study. All participants provided written informed consent prior to the participation in the study. Participants those who were included in the study were examined clinically for lateral ligament injury of the ankle joint. The subjects who had lateral ankle sprain were included in the study with period of on average 2 days with a range of 1 to 3 days of time between onset of their injuries and their inclusion in the study. Anterior talofibular ligament (ATFL), calcaneofibular ligament (CFL), and posterior talofibular ligament (PTFL) strain was confirmed by the presence of increased localized temperature, pain, swelling, ecchymosis or both, pain on passive stretching of the involved ligaments, limited range of motion, and reduced foot ankle disability index (FADI). Participants with any other open wound and or cut injury of the ankle ligament, musculoskeletal, and neurological impairment like ankle joint dislocation, any fracture or deformity at ankle joint, muscle tear, and third degree ankle sprain were excluded from the study.

Participants who met the inclusion criteria were assigned into one of the two groups. Participants in group A (FGC) received fiberglass cast and participants in group B (CB) received crepe bandage with taping. They were further divided according to the grade of injury, grade-1 and 2 denoted as A₁, A₂ and B₁, B₂ for FGC group and CB group respectively. Each group consisted of 8 participants. After taking all aseptic precaution a thin layer of cotton was wrapped over the ankle joint from 2-2.5 inches above from the lateral malleolus of fibula to nuchal line of the metatarsal head. Two layers of fiberglass cast were applied with full dorsiflexion along with slight eversion of foot and hold the foot at that position until plaster become dried, (10-15 munities). Fiberglass cast was applied to the patient for seven days. Six point mulligan taping technique was used for other group. After applying the tape ankle was wrapped by crepe bandage for 3 days. The tape was removed after 3 days and was reapplied for 4 days under aseptic precaution. Any conventional physiotherapy like ice compression, hot fermentation or ultra sound therapy was not used throughout the treatment period.

The outcomes for pain, FADI and active ROM of affected limb were measured pre & post treatment at base line and after one week correspondingly. Numerical pain rating scale (NPRS), foot ankle disability index (FADI) and goniometer were used to measure pain, ankle disability and range of motion (ROM) respectively.
Table 1: Pre and Post reading comparison of NPRS and FADI.

<table>
<thead>
<tr>
<th>Unpaired t test</th>
<th>Demographic Variables Comparison</th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age (yrs.)</td>
<td>NPRS</td>
<td>FADI</td>
</tr>
<tr>
<td>Group A</td>
<td>Group B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>21.63</td>
<td>8.13</td>
<td>119.69</td>
</tr>
<tr>
<td>S.D.</td>
<td>3.775</td>
<td>3.53</td>
<td>19.913</td>
</tr>
<tr>
<td>Mean Difference</td>
<td>1.375</td>
<td>0.665</td>
<td>8.250</td>
</tr>
<tr>
<td>t value</td>
<td>1.259</td>
<td>0.237</td>
<td>1.508</td>
</tr>
<tr>
<td>p value</td>
<td>0.2037</td>
<td>0.8143</td>
<td>0.1420</td>
</tr>
</tbody>
</table>

Table No: 2 Pre and post reading comparison of ROM in within the group.

<table>
<thead>
<tr>
<th>Paired t test</th>
<th>Plantar Flexion</th>
<th>Dorsi Flexion</th>
<th>Inversion</th>
<th>Eversion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group A Pre</td>
<td>Group B Pre</td>
<td>Group A Post</td>
<td>Group B Post</td>
</tr>
<tr>
<td>S.D</td>
<td>5.43</td>
<td>4.03</td>
<td>5.96</td>
<td>4.425</td>
</tr>
<tr>
<td>Mean Difference</td>
<td>18.75</td>
<td>10.63</td>
<td>7.50</td>
<td>4.75</td>
</tr>
<tr>
<td>p value</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0002</td>
</tr>
</tbody>
</table>
RESULTS

The data were analyzed using SPSS 16.0 version and Microsoft Office Excel 2007. The mean and standard deviation of all the variables were analyzed. Paired and independent t-test was used to analyze the results obtained over a period of week after pre-test value recording.

The descriptive data for age for both groups was matched and no difference was found. The findings of the study show that pain and foot ankle disability index was significantly improved in both groups with more improvement in the group treated with fiberglass cast [Table 1].

The results of the study also show that range of motion (ROM) (Planter flexion, Dorsiflexion, Inversion, Eversion) was significantly improved in both groups [Table 2]. Planter flexion and eversion were shows better improvement in the group treated with fiberglass cast (p=0.000), (p=0.000) compared to crepe bandage group. Findings also showed that dorsiflexion and inversion range improved equally in both groups (p=0.1676) and (p=1.000).

DISCUSSION

The incidence of ankle sprain is constantly increasing. Acute ankle injury is often associated with distressing and disabling sequel. Most patients experience decrease in level of activity, increased pain and limitation of range of motion. The aim of the study was to evaluate the effect of fiberglass on pain disability and mobility in acute ankle sprain. Although, both the treatment technique were effective in decreasing pain, disability and range of motion of ankle joint, but there was marked significant difference in the pain following fiberglass cast technique as compare to crepe bandage and taping technique. The pain was markedly reduced using fiberglass casting because it limits movement effectively following acute ankle injury, which reduced progression of inflammation, as compared to the patients who were treated with crepe bandage and taping.

Typically, the injured tissue is protected by immobilization during the first 3 weeks. Immobilization facilitates undisturbed fibroblast invasion of the injured area which results in unrestricted cell proliferation and collagen fiber production that occurs in the early stage of healing. Premature and intensive mobilization during immobilization period leads to enhanced type 3 collagen production and weaker tissue. It also causes early distension and lengthening of injured collagenous structures. However, physical training has found to increase the tensile strength of tendons and of the ligament-bone interface.

Controlled mobilization with fiberglass casting is beneficial for patients with acute ankle sprain. Thin fiberglass casting facilitates normal alignment of bone even in inflammatory phase of ankle sprain and allows the patient to move or walk. Controlled mobilization also helps collagen fiber arrangement and thereby increases the tensile strength of the ligament.

This study was limited to a sample size of 32 subjects, age group 18-35 years. Subjects were only recruited from a single centre and only data on active range of motion was collected. Future studies may be conducted with large sample size and addressing the limitations of this study.

CONCLUSION

The results of this study reveals that two layers of fiberglass cast had shown better result than crepe bandage with taping. Study also shows that fiberglass cast can be incorporated as a safe method of treatment in addition to conservative management of acute lateral ankle sprain.

REFERENCES


55. Faraj AA, Alcelik I. Recurrent ankle sprains secondary to nonunion of a lateral malleolus fracture Journal of foot and Ankle Surgery 2003:42(1); 45-4.